



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

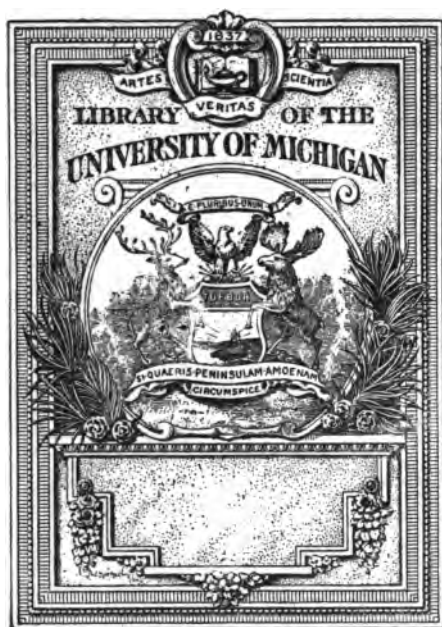
We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

B 5079Q.9



LD
2612-

¹
-m
Johns Hopkins University.

FIRST ANNUAL REPORT.

BALTIMORE, MD.

1876.

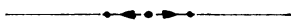
FIRST ANNUAL REPORT

OF THE

Johns Hopkins University,

BALTIMORE, MD.

1876.



BALTIMORE:
PRINTED BY WILLIAM K. BOYLE & SON,
Corner Baltimore and St Paul Streets.
1876.

TRUSTEES.

PRESIDENT :

GALLOWAY CHESTON.

TREASURER :

FRANCIS WHITE.

SECRETARY :

WILLIAM HOPKINS.

BOARD OF TRUSTEES :

GALLOWAY CHESTON,
FRANCIS T. KING,
LEWIS N. HOPKINS,
THOMAS M. SMITH,
WILLIAM HOPKINS,
JOHN W. GARRETT,
JUDGE GEO. W. DOBBIN,
JUDGE GEO. WM. BROWN,
DR. JAMES C. THOMAS,
CHARLES J. M. GWINN,
REVERDY JOHNSON, JR.,
FRANCIS WHITE.

COMMITTEES.

EXECUTIVE COMMITTEE :

REVERDY JOHNSON, JR.,
JUDGE GEO. W. DOBBIN,
JUDGE GEO. WM. BROWN,
CHARLES J. M. GWINN,
DR. JAMES C. THOMAS,
GALLOWAY CHESTON, *ex officio*.

FINANCE COMMITTEE :

JOHN W. GARRETT,
FRANCIS WHITE,
GALLOWAY CHESTON, *ex officio*.

BUILDING COMMITTEE :

JUDGE GEORGE W. DOBBIN,
FRANCIS T. KING,
THOMAS M. SMITH,
LEWIS N. HOPKINS,
GALLOWAY CHESTON, *ex officio*.

COMMITTEE IN CHARGE OF THE CLIFTON GROUNDS :

REVERDY JOHNSON, JR.
FRANCIS WHITE,
GALLOWAY CHESTON, *ex officio*.

STATEMENT OF THE TRUSTEES.

THE annual meeting of the Trustees of The Johns Hopkins University was held in Baltimore, January 3, 1876, and the officers of the previous year were re-elected.

A statement in respect to the progress which has been made in the organization of the Institution was read to the Board by the President of the University, and ordered to be printed.

The Trustees add to it the following announcement in respect to their choice of a President of the University:

Early in the month of February, 1874, the Trustees of the University having been apprised by the Executors of Johns Hopkins, of the endowment provided by his will, took proper steps for organization and entering upon the practical duties of the trust, and addressed themselves to the selection of a President of the University. With this view the Trustees sought the counsel and advice of the heads of several of the leading seats of learning in the country, and, upon unanimous recommendation and endorsement from these sources, the choice fell upon

MR. DANIEL C. GILMAN, who, at the time, occupied the position of President of the University of California.

Mr. Gilman is a graduate of Yale College, and for several years before his call to California, was a Professor in that institution, taking an active part in the organization and development of "The Sheffield Scientific School of Yale College," at New Haven.

Upon receiving an invitation to Baltimore, he resigned the office which he had held in California since 1872, and entered upon the service of The Johns Hopkins University, May 1, 1875.

The Trustees have invited him to deliver an Inaugural Address on the 22d of February, 1876, at which time an explanation of the plans of the University may be expected.

GALLOWAY CHESTON,

President of the Trustees.

25 NORTH CHARLES ST.

Baltimore, January 4, 1876.

REPORT OF THE PRESIDENT.

To the Trustees of

The Johns Hopkins University:

As the time of your Annual Meeting is at hand, it has occurred to me that it may be serviceable for you to review in a summary way the principal transactions to which you have been officially committed. I have therefore brought together the following statements, hoping that year by year, as long as the University shall exist, the example will be followed, for thus it will be easy for all who are interested in the administration of this trust to discover the principles upon which it is conducted, and to estimate the results which may come from this munificent foundation. I hope that you will deem it wise to communicate these Reports annually to the public,—for although this is a private corporation, it is

founded for public purposes,—and there is no surer safeguard for the wise administration of its affairs in all the years to come than a knowledge that it will be scrutinized by enlightened men, not only in Baltimore and the neighborhood, but wherever there is an interest in the progress of American education. It is obvious that during your deliberations, there will be constant need of reticence; the appointment of professors, the construction of buildings, and the interior management of the University are among the subjects on which it is not possible to make any public announcements before the authorities have reached their conclusions. But when the plans are formed, the public are interested in hearing of them, and in knowing the reasons which have led to their adoption. The University cannot thrive unless it has the confidence of enlightened men, and this confidence can most readily be secured by that publicity which fully and regularly makes known the conclusions of the Trustees. In this respect the oldest of American Colleges gives an example to all her younger sisters. The reports of Harvard College are models of concise and intelligible

official documents, and have doubtless helped to secure for that institution the confidence both of benefactors and teachers. It would be advantageous to the country if similar documents were published by every institution which bears the name of a college or university.

THE MUNIFICENCE OF JOHNS HOPKINS.

On the 24th of August, 1867, at the request of Johns Hopkins, a merchant of Baltimore, twelve of his friends and acquaintances, likewise residents of Baltimore, formed an Incorporation in accordance with the General Laws of the State of Maryland, under the name of The Johns Hopkins University. The signatures attached to the certificate of Incorporation were these: Thomas M. Smith, William Hopkins, Lewis N. Hopkins, John W. Garrett, Alan P. Smith, John Fonerden, Geo. W. Dobbin, Geo. M. Gill, Andrew Sterett Ridgely, Thomas Donaldson, James A. L. McClure, and Charles J. M. Gwinn.

The Trustees who were named in the certificate as managers of the University, were

these: Galloway Cheston, Francis T. King, Lewis N. Hopkins, Thos. M. Smith, William Hopkins, John W. Garrett, George W. Dobbin, George Wm. Brown, John Fonerden, Charles J. M. Gwinn, Reverdy Johnson, Jr. and Francis White.

The Trustees first met on the 13th of June, 1870, when a vacancy in the Board which had been occasioned by the death of Dr. John Fonerden, was filled by the election of Dr. James Carey Thomas. A President of the Board, Mr. Galloway Cheston, and a Secretary, Mr. William Hopkins, were then chosen. The Trustees did not meet again till after the death of Mr. Hopkins, which occurred on the 24th of December, 1873.

It then appeared that a munificent endowment for the proposed University had been left by the will of Mr. Hopkins to these Trustees. It included his late residence at Clifton, on the edge of the City of Baltimore, (an estate of 330 acres of land,) fifteen thousand shares of the Baltimore and Ohio Rail Road Stock, having a par value of \$1,500,000; and other securities having an estimated value of

24701

\$750,000. The value of the entire endowment was estimated to be more than **\$3,000,000.**

The same benefactor had given a sum of nearly the same amount for the foundation of a Hospital, and had expressed the wish that these two Institutions should co-operate for the promotion of Medical Science and Education.

His gift to the University is one of the largest single gifts ever bestowed upon an institution of learning; and is made *without conditions*, (except that the capital cannot be used for building.) so that its income as the years roll on, will be applied as the Trustees may decide for the promotion of knowledge and the advanced instruction of youth.

This bounty, so large and so wise, has attracted the admiration of enlightened men in every part of this land, and in other lands, and will doubtless secure for the giver a lasting name among the benefactors of mankind.

On the 6th of February, 1874, the Trustees entered on their administration of the trust confided to them, and on the 18th of March, 1875, they received from the executors of Mr. Hopkins, the principal part of the University bequest. From that time on, their meetings

have been frequent, and their deliberations have been directed to the right mode of employing the funds entrusted to them so as to secure the highest intellectual and moral results in the present and in future generations. It is thus apparent that although more than eight years have passed since Mr. Hopkins's purposes were in part made known to them, it is less than one year since they have been in a position to go forward efficiently.

PRELIMINARY ENQUIRIES.

It is a difficult task to organize an institution of learning on such a basis that its influence may be felt for good far beyond our own State, and far beyond our own times. The Trustees of The Johns Hopkins University have been governed by a deep sense of this responsibility. They have considered themselves bound by the munificence of the Founder's gift, and by its freedom from conditions, to observe with care the present condition of literature and science, to study the requirements of our land at its present epoch, and to discover, so far as may be possible, the ex-

perience of the most enlightened teachers and the most efficient universities in this and other lands. It is thus, and thus only, that they have hoped to escape from the dangers which are always encountered in laying the foundations of a large and enduring structure. They have also been confident that a great institution of learning, cannot, (at least in this country,) be constructed in a day or year. It must be a growth,—a natural development,—and not a pre-ordained scheme.

Governed by these considerations, one of the earliest acts of the Trustees was to open a correspondence with the heads of several of the most successful Colleges and Universities of this country. They were not mistaken in the belief that such overtures would receive a cordial response from most of those to whom they were addressed. The foundation of a new University, instead of being regarded in the older Colleges as the initiation of a rival undertaking, was recognized as a positive addition to the intellectual wealth of the country. A number of the Trustees made personal visits to some of the Colleges which are richest in traditions and material possessions, and which

now enjoy the confidence of educated men. The Presidents of three Universities communicated to the Trustees of this University, in the most unreserved manner, their opinions upon the organization and management of American Colleges, and their counsels in respect to the new foundation. Many college professors and administrators of scientific and literary institutions also gave their suggestions; and thus much of the best American experience was brought into the service of this institution at its very beginning.

A President of the University was then elected with the expectation that he would become the executive officer of the Trustees in organization and administration; and that on him would devolve the responsibility of suggesting to the Trustees, gradually, as circumstances developed, specific plans and modes of procedure adapted to give efficiency to the new University. He was encouraged by the Trustees to confer with the Teachers of Maryland to study the characteristics of educational foundations, here and in the adjacent States, and also to continue the inquiries which they had made in more distant parts of the country.

After a short time, he was authorized to visit some of the principal institutions in Great Britain and on the Continent, in order that he might confer with European scholars and bring home fresh impressions of the progress of foreign Universities, as well as plans, programmes, reports and other educational documents.

FUNDAMENTAL PRINCIPLES.

By these various steps, the Trustees have come to a substantial agreement as to the principles which must govern their earliest proceedings. As the institution grows, new light will doubtless be received, and there will be abundant opportunities to explain and defend their initial decisions. Here it is only necessary to place on record their desire that the University now taking shape should forever be free from the influences of ecclesiasticism or partisanship, as those terms are used in narrow and controversial senses; that all departments of learning,—mathematical, scientific, literary, historical, philosophical,—should be promoted, as far as the funds at command

will permit, the new departments of research receiving full attention, while the traditional are not slighted; that the instructions should be as thorough, as advanced and as special as the intellectual condition of the country will permit; that the glory of the University should rest upon the character of the teachers and scholars here brought together, and not upon their number, nor upon the buildings constructed for their use; that its sphere of influence should be national, while at the same time all the local institutions of education and science should be quickened by its power; and finally that among the professional departments, special attention should be first given to the sciences bearing upon medicine, surgery and hygiene, for which some provision has been made by the munificent gift of our founder to establish The Johns Hopkins Hospital.

OPENING OF THE UNIVERSITY.

Postponing for a time the questions of professional education, the Trustees determined that the University should commence with a

Faculty of Literature and Science, and that arrangements should be made for the reception of students in the autumn of 1876.

They also decided to postpone the construction of buildings at Clifton, (the prospective site of the University,) and to provide the requisite class rooms and lecture rooms in the heart of the city. Two convenient houses on Howard Street, have therefore been purchased, and are now being fitted up for their new uses. The adjacent land acquired by this purchase is sufficient for the construction of a library and assembly room, and of a chemical laboratory, if it is thought expedient to put this there.

DEVELOPMENT OF CLIFTON.

The Trustees have not forgotten the importance of developing the Clifton site with reference to the purposes to which it will be devoted. In addition to the constant care of the grounds, much consideration has been given to the various requirements of the University, for public buildings, residences, botanical garden, play grounds, etc., and to the best means of

approach from different parts of the city. As it is of great importance both to the city and the University that wise foresight should govern all improvements in that neighborhood, they have requested a gentleman who has no superior in the country as an advisor in respect to public grounds, to give them his counsel and suggestions respecting the management of Clifton as a suburb of Baltimore.

CURRENT EXPENDITURES.

In accordance with the wishes of the Founder no portion of the capital of his gift will be used for buildings. It is therefore necessary to lay by for some years a considerable part of the income, in order that the requisite construction funds may be at command when the buildings are commenced. The Trustees have therefore restricted themselves to an outlay of sixty thousand dollars for instruction during the first year, in addition to what is expended for administration, purchase of books and apparatus, and other essential outlays. With this allowance it will not be possible to appoint a large staff of experienced teachers.

A few leaders in the main departments of study, a company of non-resident professors and lecturers, a strong body of adjunct or assistant professors, and a promising group of associates or holders of fellowships may however be secured; and each successive year, as the wants and the capacity of the University are developed, new appointments will be made.

The unappropriated income will be separately invested as a Reserved Fund for Building and other purposes.

SELECTION OF PROFESSORS.

During the last two months, the Trustees and especially their Executive Committee, have entered upon one of the most delicate and difficult tasks which will ever come upon them. The selection of professors and teachers upon whom will devolve the instruction of youth, the chief work of the University, is peculiarly difficult because there are here no traditions for guidance, no usages in respect to the distribution of subjects, and none in respect to the kind of instruction to be given;

and also because the plans of the Trustees must depend very much upon the character of the teachers whom they bring together.

A very large number of candidates have been suggested to the Trustees; but among them all there are but a few who have attained distinction as investigators or as teachers. Most of those whose names have been thus presented are young men, usually of much promise, who have not yet had an opportunity to show their intellectual power in any department of higher instruction; and yet among this very class a discerning choice will doubtless discover those who are soon to be the men of scientific and literary renown. The Trustees propose to open freely the doors of promotion to those young men who seem to be capable of the highest work,—appointing them at first for restricted and definite periods. Moreover they hope for a while to gain much of the influence and co-operation of older and more distinguished men by inviting one and another to come here from time to time with courses of lectures. But the idea is not lost sight of that the power of the University will depend upon the character of its resident staff of permanent

professors. It is their researches in the library and the laboratory; their utterances in the class room and in private; their example as students and investigators, and as champions of the truth; their publications through the journals and the scientific treatises which will make the University in Baltimore an attraction to the best students, and serviceable to the intellectual growth of the land.

In selecting a staff of teachers, the Trustees have determined to consider especially the devotion of the candidate to some particular line of study and the certainty of his eminence in that specialty; the power to pursue independent and original investigation, and to inspire the young with enthusiasm for study and research; the willingness to co-operate in building up a new institution; and the freedom from tendencies toward ecclesiastical or sectional controversies. The Trustees will not be governed by denominational or geographical considerations in the appointment of any teacher; but will endeavor to select the best person whose services they can secure in the position to be filled,—irrespective of the place where he was born, or the college in which he was

trained, or the religious body with which he has been enrolled.

Thus far, no appointments of professors have been made by the Trustees,—though negotiations are in progress which must very soon be concluded. But the University has had in its service for several months, Mr. Henry A. Rowland, lately of the Rensselaer Polytechnic School in Troy, who has been pursuing some studies abroad in the department of Physics, and has been collecting for The Johns Hopkins University, information in respect to the manufacture and purchase of apparatus, and in respect to the construction and management of physical laboratories. The papers which Mr. Rowland has published in scientific journals abroad and at home, are the first contributions to science which have been made under the auspices of this University, and may be regarded as an indication of the work which the Trustees are ready to encourage.

FELLOWSHIPS AND SCHOLARSHIPS.

The Founder requested the Trustees to establish a number of scholarships, (freeing the

holders from tuition charges,) to be bestowed upon proper candidates from the States of Maryland, Virginia and North Carolina. Arrangements have been made for the bestowal of twenty such scholarships at the opening of the University, and probably an equal number will be annually bestowed.

Five additional scholarships, open to students from any part of the country, will be also awarded to those who appear best in an open competition.

Ten fellowships, yielding each \$500 a year, will be opened to advanced students, who may be capable of rendering assistance in the various branches of learning.

A scholarship, tenable for two years, has been temporarily provided, to be bestowed by competition on a deserving student from the Baltimore City College.

BOOKS AND SCIENTIFIC COLLECTIONS.

The Trustees have made an appropriation of thirty thousand dollars for the purchase of books, diagrams, apparatus and scientific collections. It is not proposed to attempt at

once the formation of a large library, for the Peabody Library of Baltimore, (numbering 60,000 recently purchased volumes,) has been built up as a reference library for scholars, and so long as the University remains in the City of Baltimore, professors and students will have easy access to this collection. It is proposed however, to buy at once such books as are needed every day in the University, and to keep a portion of them in one convenient reading room, as a Ready-Reference Library, and to distribute other portions among the class rooms and lecture rooms. The purchase of scientific apparatus and collections will be chiefly deferred until the counsel of professors in various departments of science can be secured. As the University develops, great advantages will come to it from its proximity to Washington, where the National Library, the National Collections in Natural History, the Army Medical Museum, etc. are of great and increasing value, and where many other National scientific institutions are also directed by scholars of renown.

A small sum of money was expended last summer under the direction of Dr. P. R. Uhler,

in collecting specimens of the fauna of Maryland.

CONCLUSION.

It is the special desire of the Trustees to cultivate the most harmonious relations with all other institutions of learning in Baltimore and elsewhere. They recognize that their institution must rest on a good system of secondary and primary schools, and they will therefore lend their influence in every legitimate way for the encouragement of public and private seminaries, which may fit scholars for the University. They are also well aware that the bounty of Mr. Hopkins, munificent as it is, will not be adequate to provide all that a cultivated community may desire to possess for the promotion of science, literature and art. It will therefore be their aim to encourage the growth of other institutions, and to seek an affiliation with them so that the Hopkins Fund, untrammelled as it is, may be directed to those objects of general importance which are not otherwise provided for in this community.

DANIEL C. GILMAN,

President of the Johns Hopkins University.

BALTIMORE, *January 1, 1876.*

APPENDIX.

COLLECTIONS IN GEOLOGY AND NATURAL HISTORY.

Doubtless the Johns Hopkins University when it is organized will be an important agency in the study of the natural characteristics of the State of Maryland. The Geology, Mineralogy and Natural History, as well as the Topography and Meteorology will be studied by the Professors and students here assembled. As a slight indication of their wishes in this respect, the Trustees last summer enlisted the assistance of Mr. P. R. Uhler, President of the Maryland Academy of Sciences, and from him they have received the following statement.

BALTIMORE, *January 15, 1876.*

With regard to the results of the appropriation of \$400 by the Johns Hopkins University, placed in my charge to secure specimens of natural history, I beg leave, respectfully, to submit the following report.

My chief aim in directing Mr. Ralph Baumhauer, the collector, was towards securing a typical series of the objects illustrative of the past and present life of a part of the State of Maryland.

Aware that the time of four months would admit of the examination of only a small area of surface, the collector was instructed to make Glymont in Charles County, a base from which to proceed up, down, and across the Peninsula. He was to pack and store the specimens there for future shipment.

Reaching the place on June 1st, he at once examined the adjacent country, and commenced to dig fossils from the Eocene

and Miocene Marl-beds of Mattawoman Creek and vicinity. The marl was hard and refractory, and rendered the acquisition of specimens slower than at some other places. By the end of that month he had visited all the larger deposits of marl, from Fort Washington on the North to Indian head on the South, and had amassed about one and a half barrels of fossils. Living objects had also been sought; and of these, two dozens tortoises, terrapins, and turtles of six species; two kinds of newts; three kinds of lizards; five kinds of snakes; embryo birds; bird's eggs; turtle eggs; the nests of mud wasps, and a few kinds of fish and mollusks were added to the stock.

The collection of fossils was valuable, and the series of tortoises precious, as showing this region to be one of those centres of varying physical influences which determine variability in the creatures subject to them. Three or four principal types of configuration and ornament are there differentiated, which include intervening links that serve to unite forever in one, several forms previously considered to be species.

Similar variability was also found to prevail in the snakes, fresh water mussels and frogs; and a most interesting addition to our knowledge was made in the case of the beautiful Southern tree-frog, *Hyla viridis*. This creature had not previously been recorded as an inhabitant of our Western peninsula, and when first taken, in the month of July, (which proved to be its time for spawning,) its bright green sides were decorated with a golden yellow stripe, which became obliterated after the love-season was past.

From this place he went farther South, collecting near Pope's Creek, Allen's Fresh and Port Tobacco; and finding Miocene fossils present in all the marl-beds.

The remainder of his time was spent in Saint Mary's county, where he amassed long series of Post-Pleiocene fossils, and considerable collections of fish, crustacea, reptiles and mollusks.

There the country was lower and more level, with physical conditions of greater uniformity, and where the forms of life

were less variable than those he had left. The fossils were more numerous in individuals, and somewhat so in genera and species. Of them, the spiral shells belonged to more recent forms, and were of more highly specialized types. The fresh water terrapins were replaced by the salt-marsh species, and the frogs, fish, mollusks and crustacea were of other kinds.

He also made a side trip across the peninsula to the Patuxent river, and brought from there the large fossil *Pectens*, the *Perna*, and other forms belonging to the Miocene beds of that section.

The general results of the expedition are embodied in a moderately representative collection of the Eocene, Miocene and Pleiocene fossil mollusca, including numerous duplicates; in a remarkable series of the Chelonian reptiles; in a fine series of the tailless and tailed *Batrachia*; and in conspicuous genera of the fish, snakes, lizards, crustacea and mollusks of the Western peninsula of Maryland on its continental side.

These collections, with the exception of two barrels of fossils stored in the warehouse at Glymont, have been all received in good condition and placed in the larger building of the University, on Howard St.

In conclusion, permit me, respectfully, to suggest that a full series of specimens of each group of these tortoises, turtles, frogs, newts, crustacea and fossils be preserved in glass jars and boxes for future reference of the professors and students of the University, so that, in all time to come, these humbler of Nature's monuments may contribute to the history of the life of the past and present, as it stands connected with the structure of our State and its Faunal districts.

A statement of the items of expenditure of the money has already, with the vouchers, been handed to your clerk.

Respectfully submitted,

P. R. UHLER.

PRELIMINARY ANNOUNCEMENT.

The Johns Hopkins University, Baltimore, Md., will receive Students on Tuesday, the third of October, 1876.

Previous to that time, and as soon as the appointments are made, the names of the Professors and Instructors in Scientific and Literary departments, will be publicly made known. The Faculties of Medicine and Law will not be organized at present, nor will all the proposed chairs in the Faculty of Philosophy be filled at first. There will be professors and assistant professors in Greek, Latin, German, French and English; in Mathematics, pure and applied; in Physics and in Chemistry; in Natural History or Biology, and in Geology. At an early day, if not at the beginning, there will be Professors in History and Metaphysics. Prolonged courses of academic lectures may also be expected from non-resident Professors, now connected with the older colleges of the country.

In respect to their courses of study, freedom of choice will be permitted to the students, but those who are matriculated as candidates for a degree will be held to a strict accountability by a system of examinations, and the diplomas of the University will be bestowed on those alone who have pursued a liberal course of instruction, and have given evidence of their high attainments.

Courses of study will be suggested or prescribed in certain cases. Special instructions may be received by non-matriculated students, who are not candidates for a degree;—and such instruction will be adapted to those who are advanced in their intellectual training, and desirous to avail themselves of the advantages which are offered here. The conditions of admission and graduation will be hereafter announced.

It is hoped that many who have received an education in colleges less liberally endowed or organized upon a different plan, will find in the Johns Hopkins University, peculiar opportunities for the prosecution of *special advanced studies*. When the Faculty has been selected more particular statements will be made of the facilities which may here be enjoyed for such work. In the mean time, letters addressed to the President of the University will receive personal replies.

Prior to the construction of suitable buildings on the proposed University site, temporary lecture- and class-rooms have been provided in the City of Baltimore, adjacent to the City College on Howard St. The University will not provide lodgings for students; but good accommodations may easily be secured in private houses.

HOPKINS SCHOLARSHIPS.

In accordance with the request of the founder of the University TWENTY scholarships, freeing the holders from charges for tuition will be opened at the commencement of the University, to young men who need this assistance. Probably an equal number of Scholarships will be annually bestowed.

The scholarships will be distributed among such candidates "from the States of Maryland, Virginia and North Carolina, as may be most deserving of choice, because of their character and intellectual promise."

Examinations will be held in Baltimore, Richmond, Staunton and Raleigh and perhaps in other places, of such candidates as may present themselves at appointed times during the summer or autumn of 1876. The Examiners will report their marks and opinions to the Trustees,—by whom the scholarships will be awarded. No publicity will be given to the names of those who are appointed or rejected, but a private announcement will be sent to each successful candidate.

These scholarships, which will be known as the "Hopkins Scholarships," may be held for four years; but are liable to be forfeited because of deficiency in scholarship, or of unworthy conduct.

The holders of these scholarships will not be exempted from the special charges usually made in laboratories for materials, etc. or from payments for special personal instruction in case it is required.

The regulations for appointments in future years will not be decided at present.

BALTIMORE CITY COLLEGE SCHOLARSHIP.

It is hoped and believed that other scholarships will be established by private liberality, or by collective subscriptions, for the encouragement of meritorious scholars, and especially to quicken among pupils in high schools and academies, a desire for University education. As an example of such a foundation, (limited to a single competition,) the following announcement is made for the year 1876.

A friend of the Baltimore City College offers a scholarship which may be held for two years, to that student in the City College who shall, near the close of his studies in 1876, pass the best competitive examination in the studies requisite for admission to the University. This scholarship will entitle the holder to ONE HUNDRED DOLLARS annually, at the end of the first and of the second year of his connection with the Johns Hopkins University, provided that his intellectual progress and conduct continue to be honorable. This scholarship may not be held by any student holding a "Hopkins Scholarship." The arrangements for the examination will be made by the Principal of the City College and the President of the Johns Hopkins University.

UNIVERSITY SCHOLARSHIPS.

FIVE scholarships to be known as the "University Scholarships," freeing the holders from charges for tuition, will be awarded to those candidates who shall pass the best competitive examination on the studies requisite for admission to the University. These scholarships shall be open to young men from any part of the country; and may be held for four years, provided that the holders continue to give evidence, which is satisfactory to the Faculty, of their high scholarship and honorable character. The examination for these scholarships will be held in Baltimore, at the commencement of the academic year, in October, 1876, and the names of the successful competitors will be publicly announced.

FELLOWSHIPS.

TEN fellowships, each yielding \$500, are offered to college graduates from any part of the country, who exhibit special acquisitions in some branch of science or literature, give promise of great intellectual merit and desire to prosecute higher studies in connection with this University.

At the end of a year, these appointments may be renewed.

The holders of these fellowships are not to engage in the professional study of law, medicine or theology. They will be expected to render some services to the University as Examiners, or as assistants to the Professors, under circumstances to be determined in individual cases.

They may give, for extra compensation, or gratuitously, instruction to such students as desire to receive it under regulations to be hereafter determined; but they will not be permitted to teach outside of the University.

The holders of these fellowships, who may be known as "Associates" or "Fellows," will be expected to reside in Baltimore, engaged in study throughout the academic terms.

USUAL CHARGES FOR TUITION.

The tuition fee will be \$80 per annum, payable in two sums of \$40 each, the first at the beginning of the academic year, and the second on the first of January. This payment will cover all charges for the general instruction of the University, matriculation, the use of the library, lecture-rooms, etc. There will be a graduation fee of ten dollars.

There will be an extra charge for chemicals, breakage, etc., in the laboratories; special examinations or private instruction in any study may also be made a special charge.

SESSIONS.

The University will be opened to students, Tuesday, October 3, 1876. The Academic year will close in June.

The usual holidays may be expected near the close of the year, and a short recess in the spring.

BALTIMORE, *Jan.* 17, 1876.

CONTENTS.

PRELIMINARY—

List of Trustees,	3
Committees,	4
Statement of Trustees respecting the choice of a President,	5

REPORT OF THE PRESIDENT, 7-25

Introduction,	7
Munificence of Johns Hopkins, the Founder, . . .	9
Estimated value of the Bequest,	11
Earliest proceedings of the Trustees,	12
Principles of the University,	15
Opening of the University,	15
Temporary Lecture-Rooms,	17
Permanent site at Clifton,	17
Current Expenditures,	18
Selection of Professors,	19
Fellowships and Scholarships,	22
Books, Apparatus, etc.	23
Collections in Natural History,	24
Conclusion,	25

APPENDIX—

Note of P. R. Uhler, on Natural History Collections,	26
<i>Preliminary Announcements</i> ,	29-32
Opening,	29
Faculty,	29
Courses of Study,	29
Advanced special Instruction,	30
Temporary rooms in Howard street,	30
Hopkins Scholarships,	30
Baltimore City College Scholarship,	31
University Scholarships,	32
Fellowships,	32
Tuition Fees,	33
Vacations,	33

when No. 1 is secured.

T65

From Pres. Angell

1877

Johns Hopkins University.

SECOND ANNUAL REPORT.

Baltimore, Maryland.

1877.

SECOND ANNUAL REPORT

OF THE

Johns Hopkins University,

Baltimore, Maryland,

JANUARY 1, 1877.



BALTIMORE:
PRINTED BY JOHN MURPHY & Co.
182 BALTIMORE STREET.
1877.

CONTENTS.

	Page.
LIST OF TRUSTEES,	8
REPORT OF THE PRESIDENT,	5
Work of the Year,	5
Buildings,	6
Memorial Tablet,	8
Professors,	9
Lecturers,	9
Associates,	11
Graduate Scholarships,	12
Other Scholarships,	15
Students,	16
Opening of the University,	18
Acknowledgments,	19
Taxation,	22

APPENDIX.

A—Minute on Organization,	25
B—Report of the Librarian,	30
C—List of Donors to the Library,	34
D—Addition to the Charter,	50

TRUSTEES.

President.

GALLOWAY CHESTON.

Treasurer.

FRANCIS WHITE.

Secretary.

WILLIAM HOPKINS.

Members of the Board.

GEORGE WILLIAM BROWN,	WILLIAM HOPKINS,
GALLOWAY CHESTON,	REVERDY JOHNSON,
GEORGE W. DOBBIN,	FRANCIS T. KING,
JOHN W. GARRETT,	THOMAS M. SMITH,
CHARLES J. M. GWINN,	JAMES CAREY THOMAS,
LEWIS N. HOPKINS,	FRANCIS WHITE.

COMMITTEES.

1876.

Executive Committee:

REVERDY JOHNSON,	CHARLES J. M. GWINN,
JUDGE GEO. W. DOBBIN,	DR. JAMES C. THOMAS,
JUDGE GEO. WM. BROWN,	GALLOWAY CHESTON, <i>ex officio</i> .

Finance Committee:

JOHN W. GARRETT,	GALLOWAY CHESTON, <i>ex officio</i> .
FRANCIS WHITE,	

Building Committee:

JUDGE GEORGE W. DOBBIN,	LEWIS N. HOPKINS,
FRANCIS T. KING,	GALLOWAY CHESTON, <i>ex officio</i> .
THOMAS M. SMITH,	

Committee in Charge of the Clifton Grounds:

REVERDY JOHNSON,	GALLOWAY CHESTON, <i>ex officio</i> .
FRANCIS WHITE,	

SECOND ANNUAL REPORT
OF THE
Johns Hopkins University.

*To the Trustees of the
Johns Hopkins University:*

GENTLEMEN:

IN accordance with your wishes, I here present the second annual report of the President of the Johns Hopkins University. In the period which it covers, we have been chiefly occupied in developing the plans of the organization upon the principles previously adopted; in the construction and adaptation of buildings for instruction and work; in the purchase of books and apparatus; and in the selection of professors and associates.

The conclusions of the Board in respect to the preliminary arrangements were stated in a Minute which was presented by a special Committee on Organization, (consisting of Messrs. George W. Dobbin, Reverdy Johnson, and James Carey Thomas), and was formally adopted by the Board, May 27, 1875. The same committee was charged with the direction of the repairs and enlargements found needful in the Howard street property. The

purchases of books and apparatus and the nomination of officers have come under the special consideration of the Executive Committee. All important and fundamental measures have received the express approbation of the Board, in whose proceedings great unanimity has prevailed.

TEMPORARY SITE OF THE UNIVERSITY.

The property on the south-west corner of Howard and Ross streets, adjacent to the City College, was bought for the University in the summer of 1875. During the past year the requisite alterations and enlargements of the buildings have been made.

The two dwelling houses on the front of the lot have been united under a new roof, and are allotted to the ordinary classes in languages, mathematics, etc. In the rear of the North building, a new structure has been built, which is called "Hopkins Hall." It contains an assembly room, seating comfortably about 200 persons; a library and reading room; and the biological laboratory. In the rear of the South building, in what is termed the "Annex," convenient rooms have been found for the physical laboratory, for the accessory rooms of the library and biological laboratory, and for the janitor's apartments. A separate chemical laboratory has been built upon the rear of the lot. These

structures, which are very simple in their external appearance, are well aired and lighted, are adapted to the present wants of the University, and are capable of enlargement, if that should be found necessary. They have been appropriately furnished and equipped with apparatus.

The chemical laboratory is a distinct building of two stories, standing on a foundation which measures forty-five by sixty-seven feet. In the basement there are rooms for metallurgical work, and for operations requiring bulky and complicated apparatus. On the first floor the main laboratory is placed, a well lighted and well ventilated apartment measuring thirty by forty-two feet, and adapted to thirty students. Near to it, is a smaller laboratory for the advanced students, a balance room, an assistant's room, and two other accessory rooms. On the second floor is the chemical lecture room, (with seats for sixty or seventy students), preparation rooms, special rooms for chemical books and collections, and the private laboratory and study of the Professor of Chemistry.

The biological laboratory situated in the third story of Hopkins Hall, includes one large room, well lighted from the north, and six smaller accessory rooms for the Professor of Biology and for advanced students.

The rooms appropriated to physics are principally in the Annex. They include apartments for special advanced investigations, and also for the work of beginners, with a study for the Professor of Physics. The lecture room for demonstrative lectures in Physics is in the main front building.

A shop for the construction and repair of scientific instruments has been provided in an adjacent dwelling house on Eutaw street.

On the south wall of the assembly room in Hopkins Hall, a brass Memorial Tablet, commemorative of the Founder of the University, bears the following inscription:—

“TO COMMEMORATE THE BOUNTY OF

JOHNS HOPKINS, OF BALTIMORE,

WHO, BY NOBLE GIFTS FOR THE ADVANCEMENT OF LEARNING
AND THE RELIEF OF SUFFERING, HAS WON THE GRATITUDE OF
HIS CITY AND HIS COUNTRY.”

This tablet is the gift of one of the Trustees, Reverdy Johnson, Esq.

THE UNIVERSITY STAFF.

In accordance with their general policy, the Trustees have appointed as yet but a small part of the staff which it is intended to bring together, reserving to a future day the enlargement of the Faculty. The professors entered upon their work at the beginning of the academic year, and have

since that time given valuable counsel not only in respect to their own departments of study, but in respect to the general policy of the University. Their names and departments are as follows:

PROFESSORS.

1. GILDERSLEEVE, BASIL L. *Greek.*
A. B., Prinot. 1849; A. M., Prinot., 1852; Ph. D., Göt., 1853; LL. D., Wm. and M., 1869;
Prof. of Greek, Univ. of Va., 1856-76; Prof. of Latin, Univ. of Va., 1861-66.
2. MARTIN, H. NEWELL *Biology.*
M. B., Univ. of Lond., 1871; Dr. Sc., Univ. of Lond., 1872; A. B., Univ. of Camb., 1874;
Fellow and late Lect. on Nat. Hist., Christ Coll., Camb.; Fellow of Univ. Coll., Lond.
3. MORRIS, CHARLES D. *Latin and Greek.*
A. B., (Worcester Coll.) Oxford, 1849; A. M.; Fellow of Oriel Coll., Oxford, 1852; Prof. in the Univ. of N. Y., 1875-76.
4. REMSEN, IRA *Chemistry.*
Coll. City of N. Y.; M. D. Coll. of Ph. and Surg., N. Y., 1867; Ph. D., Göt., 1870; Prof. of Chem., Wms. Coll., 1872-76, and previously Assist. in Chem., Univ. of Tübingen.
5. ROWLAND, HENRY A. *Physics.*
C. E., Renss. Polyt. Inst., Troy, 1870; Assist. Prof. in the same, 1872-75.
6. SYLVESTER, J. J. *Mathematics.*
A. M., Univ. of Camb.; F. R. S., Lond. & Edin; Corr. Mem. Inst. France; Mem. Acad. of Sci. in Berlin, Göt., Naples, Milan, St. Petersburg, etc; LL. D., Univ. of Dub., Univ. of Edinb.; late Prof. Math. Royal Mil. Acad., Woolwich.

LECTURERS.

In addition to the resident staff of professors, the Trustees have invited the coöperation, for limited periods, of the gentlemen below named, most of whom are connected with other institutions of learning.

Their names are as follows :

1. **BILLINGS, JOHN S.** (Washington.) . . . *History of Medicine.*
A. B., Oxf., O., 1857; A. M., Oxf., O., 1860; M. D., Cincin., 1860; Assist. Surgeon now in the Surgeon-General's Office, U. S. A., Wash.
2. **CHILD, FRANCIS J.** (Harvard Univ.) . . . *English Philology.*
A. B., Harv., 1846; A. M., Harv., 1849; Ph. D., Gött., 1854; Prof. in Harv. Univ.
3. **COOLEY, THOMAS M.** (University of Michigan.) . . . *Law.*
LL. D., Univ. of Mich., 1873; Chief Justice of Mich.; Prof. of Law, Univ. of Mich.
4. **HILGARD, JULIUS E.** (Washington.) . . . *National Surveys.*
Assist. in charge U. S. Coast Survey; Pres. Am. Assoc. for Advancement of Science, 1875-76.
5. **LOWELL, JAMES R.** (Harvard Univ.) . . . *Modern Literature.*
A. B., Harv., 1837; A. M., Harv., 1841; D. C. L., Univ. of Oxf. 1873; LL. D., Univ. of Camb., 1874; Prof. of Mod. Lit. in Harv. Univ.
6. **MALLET, JOHN W.** (Univ. of Virginia.) *Technological Chemistry.*
A. B., Trinity Coll., Dub., 1833; Ph. D., Gött., 1852; M. D., Univ. of La., 1868, and LL. D., Wm. and M., and Univ. of Miss., 1872; Prof. in the Univ. of Va.
7. **NEWCOMB, SIMON.** (Washington.) . . . *History of Astronomy.*
B. S., Harv., 1836; Ph. D., Leyden, 1875; LL. D., Columbian Univ., 1874, and Yale, 1875; Prof. of Math. U. S. Navy attached to U. S. N. Observ., Wash.; Assoc. of Roy. Ast. Soc., 1872; Cor. Mem. of Inst. of France, 1874.
8. **RABILLON, LÉONCE.** (Baltimore.) *French.*
Bach. ès Lettres, 1832; and Licencié en Droit, 1836, Univ. of France.
9. **WALKER, FRANCIS A.** (Yale College.) . . . *Political Economy.*
A. B., Amh., 1860; A. M., Amh., 1863; A. M., Yale, 1873; Ph. D., Amh., 1875; Prof. in Sheff. Sci. School, Yale Coll.; Sup. U. S. Census of 1870.
10. **WHITNEY, WILLIAM D.** (Yale College) *Comparative Philology.*
A. B., Wms., 1845; A. M., Wms., 1848; Ph. D., Bresl., 1861; LL. D., Wms., 1868; Wm. and M., 1869; St. Andr., 1874; Harv., 1876; Prof. in Yale Coll.

The times appointed for these gentlemen to lecture here are shown in this schedule.

NAME.	No.	BEGIN.	END.	DAYS.	Hour.
Rabillon, . . .	20	Oct. 5.	Dec. 12.	Tu. Th.	5 o'clock.
Newcomb, . . .	20	Nov. 8.	Dec. 18.	M. W. F.	4 "
Billings, . . .	10	Jan. 3.	Jan. 16.	Tu. Th.	4 "
Lowell, . . .	20	Jan. 31.	Feb. 27.	Daily.*	5 "
Child, . . .	20	Jan. 31.	Feb. 27.	Daily.	4 "
Whitney, . . .	20	Mar. 6.	Apr. 6.	T. W. Th. F.	5 "
Hilgard, . . .	20	Apr. 9.	May 4.	Daily.	4 "
Walker, . . .	20	Apr. 9.	May 4.	Daily.	5 "
Cooley, . . .	20	May 7.	June 1.	Daily.	4 "
Mallet, . . .	20	May 10.	June 3.	Daily.	5 "

* 4 o'clock except Saturday and Sunday.

ASSOCIATES.

Several younger men have also been selected as Assistant Instructors and Associates of the University. Their names are as follows:

1. BRANDT, HERMANN C. G. *German.*
A. B., Hamilton, 1872; A. M., 1875; Assist. Prof. Mod. Lang. in Hamilton Coll., 1874-76.
2. BROOKS, WILLIAM K. *Natural History.*
A. B., Williams, 1870; Ph. D., Harv., 1875.
3. CROSS, JOHN M. *Latin and Greek.*
A. B., Princet., 1867; A. M., Princet., 1870; Tutor of Greek in Princet. Coll., 1873-76.
4. ELLIOTT, ARTHUR M. *Languages.*
A. B., Haverford; A. B., Harv. 1868.
5. HASTINGS, CHARLES S. *Physics.*
Ph. B., Yale, 1870; Ph. D., Yale, 1873; Holder of the "Tyndall Scholarship," in Paris, 1875

6. **MORSE, HARMON N.** *Chemistry.*
A. B., Amh., 1873; Ph. D., Gött., 1875.
7. **MURRAY, THOMAS C.** *Semitic Languages.*
A. B., Williams, 1869; A. M., Williams, 1876.
8. **RIDGWAY, ROBERT** *Natural History.*
Collaborator in Nat. Hist. of the Smithsonian Institution, Washington.
9. **SCOTT, AUSTIN** *History.*
A. B., Yale, 1869; A. M., Univ. of Mich., 1870; Ph. D., Leipsic, 1873; late Instructor in Hist. Univ. of Michigan.
10. **STORY, WILLIAM E.** *Mathematics.*
A. B., Harv., 1871; Ph. D., Leips., 1875; Late Tutor of Math. in Harv. Coll.
11. **TYLER, ARTHUR W.** *Library.*
A. B., Amherst, 1867; A. M., Amherst, 1870; late Assist. Librarian, Astor Lib., N. Y., 1871-76.
12. **UHLER, PHILIP R.** *Natural History.*
Librarian of the Peabody Inst., and President of the Maryland Acad. of Sciences.

GRADUATE SCHOLARSHIPS.

In the summer of 1876, the Trustees, wishing to extend the advantages of the foundation to graduates of colleges and advanced scholars from any place, offered twenty Fellowships or Graduate Scholarships, yielding \$500 a year and renewable, to be bestowed for excellence in any of the following subjects:

PHILOLOGY,
LITERATURE,
HISTORY,
ETHICS AND METAPHYSICS.
POLITICAL SCIENCE,

MATHEMATICS,
ENGINEERING,
PHYSICS,
CHEMISTRY,
NATURAL HISTORY.

The offer was made in the following terms:

CONDITIONS.

The object of this foundation is to give to scholars of promise the opportunity to prosecute further studies, under favorable circumstances, and likewise to open a career for those who propose to follow the pursuit

of literature or science. The University expects to be benefitted by their presence and influence, and by their occasional services; from among the number it hopes to secure some of its permanent teachers.

1. The applications must be made in writing prior to June 1, 1876. The decision of the Trustees will doubtless be made within a few days subsequently.

2. The candidates must give evidence of a liberal education (such as the diploma of a college of good repute); of decided proclivity toward a special line of study (such as an example of some scientific or literary work already performed); and of upright character (such as a testimonial from some instructor.)

3. The value of each Fellowship will be five hundred dollars, payable in three sums, viz: \$100, October 1; \$200, January 1; \$200, June 1. In case of resignation, promotion, or other withdrawal from the fellowship, payments will be made for the time during which the office may have been actually held.

4. Every holder of a Fellowship will be expected to render some services to the Institution as an Examiner, to give all his influence for the promotion of scholarship and good order, and in general to coöperate in upholding the efficiency of the University as circumstances may suggest. He must reside in Baltimore during the academic year.

5. He will be expected to devote his time to the prosecution of special study, (not professional,) with the approval of the President, and before the close of the year, to give evidence of progress by the preparation of a thesis, the completion of a research, the delivery of a lecture, or by some other method.

6. He may give instruction, with the approval of the President, by lectures or otherwise, to persons connected with the University,—but he may not engage in teaching elsewhere.

7. He may be re-appointed at the end of the year.

8. These regulations are prescribed for the first year only.

Out of one hundred and fifty-two applicants, one hundred and seven eligible candidates were selected, comprising graduates from forty-six different colleges. Their applications were referred to specialists in each department, who examined

carefully the claims of the candidates and reported to the Trustees the persons whom they deemed worthy of receiving the appointment.

Two of those who received Fellowships were subsequently appointed Associates, namely, Dr. W. K. Brooks, and Dr. H. N. Morse. One of them, a scholar of unusual promise in the department of Physics, Porter Poinier, S. B., a recent graduate of the Stevens Institute of Technology, died before he received information of his appointment. The list, as finally matured, was as follows:

FELLOWS.

1. ADAMS, HERBERT B. *History.*
A. B., Amherst, 1872; Ph. D., Heidelberg, 1876.
2. ADAMS, HENRY C. *Political Science.*
A. B., Iowa College, 1874.
3. CLARK, SAMUEL F. *Natural History.*
Assistant in Zoology, Yale (Shef. Sci. Sch.) Asst. Zoölogist U.S. Fish Commission, 1874-75.
4. CRAIG, THOMAS *Mathematics.*
C. E., Lafayette, 1875.
5. GORE, JOSHUA *Mathematics.*
C. E., University of Virginia, 1875.
6. HALSTED, GEORGE B. *Mathematics.*
A. B., Princeton, 1875; Fellow in Mathematics, Princeton, 1875.
7. HART, EDWARD *Chemistry.*
S. B., Lafayette, 1874; Instructor in Chem., Lafayette Coll.
8. HERING, DANIEL W. *Engineering.*
Ph. B., Yale, (She. Sci. Sch.) 1872.
9. ILES, MALVERN W. *Chemistry.*
Ph. B., Columbia, (Sch. of Mines.) 1875.
10. JACQUES, WILLIAM W. *Physics.*
S. B., Mass. Inst. of Technology, 1876.

11. LANMAN, CHARLES R. *Philology.*
A. B., Yale, 1871; Ph. D., Leipzig, 1875.
12. MEANS, D. MCGREGOR *Political Science.*
A. B., Yale, 1868.
13. PAGE, WALTER *Philology.*
A. B., Rand. Macon, 1875; Assist. Prof. of Greek, Rand. Macon.
14. PRESTON, E. DARWIN *Engineering.*
A. B., Cornell, 1876.
15. RICE, HENRY J. *Natural History.*
S. B., Cornell, 1876.
16. ROYCE, JOSIAH *Literature.*
A. B., University of California, 1875.
17. SAVAGE, A. DUNCAN *Philology.*
B. Litt., University of Virginia, 1870.
18. SIHLER, ERNEST G. *Philology.*
Concordia, 1869.
19. VANVORST, FREDERICK B. *Ethics and Metaphysics.*
A. B., Princeton, 1875; Fellow in Metaphysics, Princeton, 1875.
20. WHEELER, JOHN H. *Philology.*
A. B., Harvard, 1871; A. M., 1875.

UNDERGRADUATE SCHOLARSHIPS.

In accordance with the previous announcements and with the Founder's request, the Trustees offered twenty scholarships to students from Maryland, North Carolina and Virginia, found "most deserving of choice because of their character and intellectual promise." Two delegates from the University visited Staunton, Richmond and

Raleigh, in the summer of 1876, for the purpose of making known the conditions of these scholarships to those who were interested in them, and of examining such candidates as applied. The number of candidates at these preliminary examinations was quite small, notwithstanding the advertisements in the public journals. Subsequently, however, a considerable number of applications were received, and scholarships were bestowed by the Trustees on twenty young men, three from Virginia, one from North Carolina, fourteen from Maryland, and two (by exception, as vacancies were found to exist) from Kentucky.

The University Scholarships, which differ from the Hopkins Scholarships in being honors won at examinations, and open to competitors from any place, were awarded by the Faculty, to George W. McCreary, a graduate in 1874, of the Baltimore City College, and to Alldin M. Sprigg, a recent student of St. John's College. The number of competitors was four.

The bestowal of the Baltimore City College Scholarship was postponed with the concurrence of all interested parties, until a later time.

STUDENTS.

It was not expected that the number of students would be large during the earlier years

of the University. Indeed it has been commonly thought desirable, that in this respect, as in others, the University should establish a good nucleus around which, year after year, other good elements may cluster. The completed Register for the year includes the names of 89 students, including 20 who hold Fellowships. Of these, 54 have already received academic degrees; twelve have matriculated as candidates for the Bachelor's degree in this University, and twenty-three have been received as special students. No preparatory department has been organized, and none is contemplated.

Of the graduate students, eighteen have taken the degree of Bachelor of Arts, seven have taken the Baccalaureate degree in Philosophy, Science or Letters, four the degree of Civil Engineer, eighteen the degree of Doctor of Medicine, and seven the degree of Doctor of Philosophy.

These graduates bear diplomas from twenty-five institutions. Five of the diplomas of Doctors of Philosophy were received in Germany; fourteen, of Doctors of Medicine, were received at the University of Maryland; three graduates each are from Amherst, Cornell, Princeton, Yale and the University of Virginia; two each from Harvard, Lafayette, and Washington and Lee, and the others are from twelve American institutions, one from each.

As reported to the University, the homes of these students are as follows:

In Maryland,	57
Massachusetts,	6
Virginia,	6
Illinois,	8
New York,	8
Pennsylvania,	8
California,	2
Kentucky,	2
Indiana,	2
Connecticut,	1
Iowa,	1
New Jersey,	1
North Carolina,	1
South Carolina,	1
	<hr/> 89

OPENING OF THE UNIVERSITY.

The work of the University was inaugurated February 22, 1876, (Washington's Birth Day,) by appropriate exercises in the Academy of Music, which were attended by the Governor of the State, the Mayor of the City, numerous representatives from colleges and other institutions of learning in the Atlantic States, and by a large assembly of the citizens of Baltimore. Special interest was given to the occasion by the Address of the President of Harvard University, the oldest American college, who thus bore testimony to the interest with which this new foundation is regarded in a seat of learning at a distance from Baltimore. The

addresses delivered on this occasion were printed in a pamphlet form and widely distributed.

A special address was subsequently made before an assembly of the youth of Baltimore, in the lesser hall of the Academy of Music, May 27.

During the visit of Professor Huxley to this country, he accepted an invitation from the Trustees to deliver an Address on University Education, in the Academy of Music, on the 12th of September. The discourse was received with marked attention both in this country and in England.

Examinations for admission to the University were first held in Baltimore, July 13th, and were resumed September 13th. The organization of the classes was begun on the 3d of October. On the evening of that day the Trustees, the corps of Instructors, and the Students, assembled in Hopkins Hall, where a familiar statement was made by the President, of the methods of instruction and government which it was proposed to follow. On the following morning the instructions began.

ACKNOWLEDGMENTS.

The public acknowledgments of the University are due to several institutions and persons from whom favors have been received, especially to the Peabody Institute, which has brought to-

gether a library of 60,000 volumes, selected for the use of scholars, on which the University must for a long time, if not always, depend. To the Provost, Dr. Morison, and the Librarian, Mr. Uhler, our thanks are given for many acts of courtesy, personal and official.

The following resolutions indicate the friendly relations of the Trustees of the two Institutions, and give an assurance that each organization will promote the purposes of the other, without interference or reduplication.

The Board of Trustees of the Peabody Institute of the City of Baltimore, at their Annual Meeting, February 12th, 1876,

"In view of the establishment of the Johns Hopkins University in our community, and of the wide field thus opened for the advancement of the intellectual and moral welfare of our people; and, desiring to establish, at the earliest date, affiliation with it in promoting the educational interests of the State:

"Resolved, That the Board of Trustees of the Peabody Institute convey to the President and Trustees of the Johns Hopkins University this expression of interest and good will; suggesting that this Institute being, within its scope, an educational element of the State, should be in sympathy with the University, and by interchange of courtesy and coöperation, assist in its high educational aims.

"Resolved, That the Secretary address a copy of the Resolutions to the President and Board of Trustees of the Johns Hopkins University."

ATTEST,

GEO. P. TIFFANY,

Secretary.

On the reception of the foregoing resolutions, by the University Trustees, it was, on motion

"Resolved, That the President and Trustees of the Johns Hopkins University reciprocate, most cordially, the sentiments conveyed in the

communication referred to, and heartily unite in the desire to join hands with the Peabody Institute, in all that could advance the cause of education, refinement and culture in our City and State; and would convey to the President and Trustees of the Peabody Institute, their appreciation of the courtesy which prompted the expressions conveyed in their Resolutions.

“Resolved, That the Secretary be requested to remit a copy of the Resolution to the President and Trustees of the Peabody Institute.”

ATTEST,

WILLIAM HOPKINS,

Secretary.

From the Secretary of the Smithsonian Institution, Prof. Henry, and the Assistant Secretary, Prof. Baird, repeated assurances have been received of their interest in the University, and of their desire to render the National collections of service to the University.

The Library of the Maryland Historical Society, and the Library of the Mercantile Library have also been of much service to us. In the rooms of the Maryland Historical Society, a class of students of American history have found available an excellent collection of documents and memoirs.

The University has also received some noteworthy gifts.

On the death of Dr. Henry Willis Baxley, a well known physician of Baltimore, which occurred March 13th, 1876, it was found that he had made the University his residuary legatee, for the purpose of establishing in the Medical department a professorship of Medicine. It will be appropriate

to refer more particularly to this bequest and to the generous purposes of the donor, after the settlement of the estate which is at present in litigation.

From the India Office, in London, the Library received a very important collection of books, chiefly Sanskrit texts, and works illustrative of them. This generous gift was particularly welcome.

From a native of Baltimore, Henry Holt, Esq., now a Publisher in New York, more than one hundred valuable volumes which have been issued by the firm to which he belongs, were received.

Mrs. Burr Porter, of Boston, presented a set of the Reports of the British Association, which belonged to her relative the late Porter Poinier, a Fellow of this University.

Mrs. Jared Sparks presented a set of the North American Review, and some other works of value from the library of the late President Sparks of Harvard University.

From Hon. A. Bowie Davis, Reverdy Johnson, Esq., Mr. Thomas C. Murray, and others, numerous gifts have been received, a list of which is given in the Appendix.

TAXATION.

The last Assembly of Maryland passed an Act revising the State system of taxation. By its general provisions the University property became

liable to taxation, and its income has thus been materially reduced. The following remonstrance to the Act was presented before its passage.

To the Honorable, the General Assembly of Maryland:—

The Trustees of the JOHNS HOPKINS UNIVERSITY respectfully present the following petition.

A citizen of Baltimore has founded, on a liberal basis, free from ecclesiastical and partisan control, an institution of the highest sort for the instruction of youth. He has given a University to Maryland.

In other enlightened states, such institutions have been regarded as worthy to receive from the public treasury liberal appropriations for their foundation and maintenance; because it has been conceded that universities promote the prosperity and happiness of the communities where they are placed,—the wealth, the strength, the influence, and the virtue of the people.

From the obligation to establish a University, Maryland has been freed by this act of a citizen, who has provided, by his sole bounty, such an endowment as has been accumulated in the older communities by generations of economy and self-denial; such an endowment as the newer states have not equalled by their munificent land grants and their direct appropriations from the public chest.

The benefit of this new foundation will extend far beyond the students who come under its instruction; its funds will be devoted to the promotion of all useful knowledge; its advantages will be open to students who are preparing for any educated calling; its trustees are serving without any recompense except the consciousness of promoting the public good. Among other services, the new university will be of especial advantage to the school system of the State, inspiring their scholars and training their teachers.

In other states, irrespective of public grants, incorporated and endowed universities have been recognized as of such high and exceptional utility, that their property has been exempted from taxation.

The argument for such exemption is brief but clear. It is of no gain to the state to lay a tax upon that which is devoted to the service of the state. The people would not be benefitted but injured by a tax upon roads, parks, courthouses, hospitals and other property solely devoted to the public good.

The taxation of a university discourages benefactions, while its exemption from taxation encourages gifts.

Erroneous notions are prevalent in respect to the income of this university. It is less than is absolutely essential for the immediate needs of the institution which it is proposed to create; less than that of Harvard,

Yale or Columbia College. Diminution of this income by taxation will diminish to just that extent the usefulness of the foundation.

Your petitioners therefore pray that the property of the **JOHNS HOPKINS UNIVERSITY** be exempted from taxation.

(Signed,)	GALLOWAY CHESTON,	GEORGE W. DOBBIN,
	REVERDY JOHNSON,	GEORGE W. BROWN,
	THOMAS M. SMITH,	JOHN W. GARRETT,
	J. CAREY THOMAS,	FRANCIS T. KING.

BALTIMORE, March 24th, 1876.

A Report of the progress of the instruction during the current year, is deferred till the next annual statement.

Respectfully submitted,

D. C. GILMAN,

President of the Johns Hopkins University.

JANUARY 1, 1877.

APPENDIX.

A.

Minute adopted by the Board, May 25, 1875.

[Two paragraphs subsequently modified, are omitted.]

TIME AND PLACE OF BEGINNING.

1. The instructions to be given by the Johns Hopkins University will commence in the buildings in Howard street recently purchased by the Trustees ; but this shall be regarded as only a temporary arrangement until plans can be formed for the permanent buildings of the University and these buildings in part at least constructed. Instruction will commence in October, 1876, and continue till the following June.

IMPROVEMENT OF THE HOWARD ST. PROPERTY.

2. This Committee shall have power to make such alterations in the interior of the Howard street property as will adapt it to the immediate needs of the University, and to provide for it the necessary furniture.

LITERARY AND SCIENTIFIC DEPARTMENT TO BE FIRST CONSIDERED.

3. The organization of the departments of medicine and law shall be postponed ; and the first attention of the President and of the Committee shall be directed to the departments of literature and science.

ESTABLISHMENT OF A RESERVE FUND.

4. As the conditions of the foundation do not permit the use of any portion of the capital for buildings, the Trustees will establish a " Reserved Accumulating Fund " to which the unappropriated income shall be transferred for the requirements in building, and for such other purposes as the Board may hereafter determine.

RELATIONS OF THE FACULTY TO THE TRUSTEES.

5. The organization of the literary and scientific classes of the University shall proceed gradually. When the conclusions of the Board are matured on questions of administration and government, these conclusions shall be formally adopted as the principles by which the University will be governed,—but the detailed methods by which these principles must be carried out, shall chiefly rest with the Faculty, subject to the approval of the Board.

ESTIMATED EXPENSES OF INSTRUCTION.

6. As an approximate estimate of the outlays to be incurred for instruction at the beginning of the University the following sums are designated, subject to such modifications as the future may determine:

For the year 1876–7, a sum not exceeding \$60,000 ; for 1877–8, \$75,000 ; for 1879–80, \$90,000.

NOMINATION OF PROFESSORS.

7. The Executive Committee shall forthwith direct the President to make inquiries in respect to the selection of Professors and Instructors, and this committee shall report to the Board, next autumn, the result of these inquiries, with the names of such persons as they recommend for appointment. An interval of two weeks shall pass after such a report is made before the Board proceeds to the election of any permanent professor.

THREE CLASSES OF TEACHERS.

8. The Committee shall have in mind the appointment of three classes of teachers:

CLASS I, the permanent Professors, on whom will rest the chief responsibility of instruction and government, and who will be expected to give to the University their time and strength.

The effort shall be made to secure the services of men of acknowledged ability and reputation, who are distinguished in special departments of study and who are capable of advancing these departments and of inciting young men to study and research. Among the number should be some who can be especially helpful

in the organization of the University, and in influencing the character of young men.

CLASS II will include Professors and Lecturers, resident or non-resident in Baltimore, who will give but a limited amount of time and service to this University, and who will not be expected to take part in the administrative-work. These instructors should be men of attainments in specialties which do not at present require full professorships, and men whose marked ability will be of service to the University. Professors in other colleges may thus be called to the Johns Hopkins University for a portion of the year, and possibly men from other lands.

CLASS III will include Adjuncts and Assistants, who will usually be appointed for periods varying from one to five years. Their work will be chiefly subordinate to and in connection with the work of the permanent professors, who should be consulted in respect to their selection. The effort should be made to secure young men of ability and promise from whom the staff of permanent teachers may be in time reinforced.

SECTARIAN AND POLITICAL TESTS.

9. In the appointment of the Faculty care shall be taken to avoid sectarian and political influences, and the effort shall be made to bring together a staff of teachers who are known and esteemed in different parts of the country.

DEPARTMENTS OF INSTRUCTION.

10. Among the earliest departments of instruction to be provided are the following:

1. ANCIENT LANGUAGES, including Greek, Latin, Comparative Philology, etc.

2. MODERN LANGUAGES, including English, French, German, Spanish, Italian, etc.

3. MATHEMATICS, including Pure and Applied.

4. PHYSICAL SCIENCES, including Chemistry and Physics.

5. NATURAL SCIENCES, including Geology, Mineralogy, Zoology and Botany.

6. MORAL AND HISTORICAL SCIENCES, including Ethics, Political Economy, History, International and Public Law, etc.

BOOKS AND APPARATUS.

11. The Executive Committee shall have authority to secure such books and apparatus as may be needed for the immediate work of the University, consulting with the professors in different departments as they may be appointed.

It is presumed that at the outset the following sums may be requisite:

For books,* \$5,000; for chemical and philosophical apparatus, \$10,000; for scientific collections, \$10,000; for diagrams, maps, photographs, \$5,000;—\$30,000.

REQUISITES FOR ADMISSION AS STUDENTS.

12. No person shall be enrolled as a student in the University until he has completed sixteen years of age, and has given to the authorities satisfactory evidence, on examination or otherwise, that he is proficient in those preliminary studies required for admission to the best colleges and schools of science in the country; and he shall further, before his admission to any special courses of study which may be established in the University, satisfy the authorities by examination that he is qualified to pursue said special courses.

DEGREES.

13. The examinations for degrees shall be strict and comprehensive. The degree of B. A. shall be given for proficiency in classical studies, and that of B. Ph. for proficiency in scientific studies; but these degrees shall represent an equal amount of hard study pursued in different directions, and shall be coördinate in rank; and the candidates for these degrees shall have equal consideration in all the plans of the University. The second degree of Master of Arts and of Doctor of Philosophy shall be given on examination only, at an interval of at least two years subsequent to the first degree.

* With reference to the small amount suggested for the Library it should be said that the Peabody Library will for a time be the chief reliance of the University for costly books; and with reference to scientific collections it should be said that much may be secured by engaging the services of naturalists who will enter upon the work of collecting in the field and establishing a system of exchanges.

SPECIAL ADVANCED INSTRUCTION.

14. Special facilities and encouragement shall be given to the graduates of colleges to come and profit by the instructions here provided, with or without reference to professional work or to the taking of a second degree. The effort shall thus be made to extend the benefit of the University to distant parts of the land, though it is also thought that many residents of Baltimore will be glad to avail themselves of such opportunities.

SCHOLARSHIPS.

15. The scholarships provided by the founder shall be bestowed in part publicly, as the result of a competitive examination, and in part privately as an aid to the needy. These scholarships shall exempt the holder from any charge for tuition. Scholarships dependent on merit shall not be held longer than two years without reëxamination and competition; other scholarships shall be annually bestowed.

B.

Organization of the Library.

REPORT.

President D. C. GILMAN,

SIR: It is my duty to report the completion of the organization of the Library on the plan and within the appropriation of the Board of Trustees. A full statement of the expenditures and arrangement is appended.

Up to the first of April, 1876, when I was placed in charge, there had been collected about 250 volumes, chiefly works on education, for use in the offices of the University. The month of April was spent in a careful examination of the methods of arrangement in several prominent libraries of the country. Early in May the lists of books for purchase were prepared, and these were mostly ordered from England and Germany through the usual channels. At the same time some favorable purchases were made in this country; worthy of mention is that of a large portion of the French exhibit of books at the International Exhibition at Philadelphia. In August we began to receive our purchases, which were placed in temporary rooms for classification and cataloguing. In October the permanent rooms of the Library were occupied and the books arranged in their present position.

In the organization of the Library several principles were clearly marked out by the Trustees, viz :

1. To gather a small reference library of such books as it was essential to have constantly at hand ; and to supplement this, from time to time, as the growth and needs of the University should render necessary.

2. To collect for the different departments special libraries to be placed apart for their ready use and reference.

3. To render accessible, by an arrangement with the other libraries of Baltimore, all valuable periodicals in the various branches of scholarly research.

4. To secure for the members of the University an opportunity for the inspection of noteworthy books of general interest, whose purchase was not included in the plan of the library proper.

5. To arrange the library in rooms easy of access, and open for reading and study during such hours of the day and evening as would be convenient for all.

These plans have, in the main, been successfully worked out.

GENERAL LIBRARY.

There have been purchased 3,142 volumes, at an average cost, binding included, of \$2.40 per volume, a rate which may be considered very favorable in view of the class of books collected. In these purchases care has been exercised to make the library encyclopædic in character, and in this respect it compares favorably with many of our larger libraries.

A small collection of the standard texts and works of reference in use in the University has also been formed. No book has been bought as a rarity, but the endeavor has been made in every case to secure the latest or the most approved edition.

There have been presented 859 volumes, a detailed statement of which is annexed. Particular mention should be made of the gift of a most valuable collection of Indian literature by the India Office, London ; of a full and choice selection from his publications by Henry Holt, Esq., of New York ; of a set of the North American Review and some valuable pamphlets by Mrs. Jared

Sparks, of Cambridge, Mass.; of rare books on the history of Maryland, by Hon. A. B. Davis, of Montgomery County, Md.; and of works on History and Roman Law, by Reverdy Johnson, Esq., of Baltimore.

A few of the officers of the University have deposited their own books with the Librarian, under guaranty of safe keeping and return upon proper notice. This arrangement is considered mutually beneficial as securing to the library valuable books not otherwise procurable, and to the owner ease of access and proper arrangement with books of the same class. There are on our shelves 469 volumes thus deposited.

The Library contains in all 4,600 bound volumes, and 315 unbound pamphlets. Orders now outstanding will increase the number to over 5,000 volumes. The entire collection has been collated, catalogued, and so arranged as to be readily accessible.

SPECIAL LIBRARIES.

Beginnings have been made in special libraries for several of the departments, whose books are for the present kept in the general library. Under a separate appropriation quite a complete collection has been bought for the Chemical department, which will be placed in the rooms of the laboratory. This promises to be one of the most useful features of the library; and it is hoped that there will grow up around each department of the University a complete apparatus of books suited to its needs.

PERIODICALS.

The Library now receives 207 serial publications. Periodicals taken in the other libraries have not, save in a few instances, been duplicated; but the effort has been so to supplement the lists of the other institutions as to render accessible, somewhere in the city, every journal of scientific or literary value. In November a Finding List of Periodicals and Serials, taken at the different

libraries of Baltimore, which included 511 titles, was issued. A new edition enlarged by about 200 titles and a subject index will shortly be published.

NEW BOOKS.

Under an especial appropriation, the best of the new books appearing from time to time are secured. These are placed in a separate section, and are loaned under certain restrictions. They are retained for three months and then sold at a reduced rate. This plan has approved itself and, probably, will be largely self-supporting.

ARRANGEMENT.

The arrangement of the Library is novel and attractive. In the main room the books of reference in greatest demand are arranged on shelves, convenient of access. The periodicals and new books are also here. The room is carpeted, and well-furnished, and in every respect is an inviting centre for the members of the University. Opening from this is a suite of five smaller rooms, the first of which is used as the Library working room. In the remaining four are placed the special libraries. These are provided with convenient desks, so that the student may gather around him the books of his department and secure uninterrupted quiet. All the rooms are well heated and lighted, and remain open from 9 A. M. until 10 P. M.

The permanent charge of the Library has been placed in the hands of Mr. Arthur W. Tyler, late of the Astor Library, New York.

THOMAS C. MURRAY,

Associate in Charge of the Library.

JOHNS HOPKINS UNIVERSITY,
Baltimore, January 1st, 1877.

C.

List of Donors to the Library,

Prior to January 1, 1877.

- ACOLLAS, ÉMILE. (*The Author.*) Paris.
Manuel de droit civil. 8 v. Paris, 1874. 8vo.
- ALLEN, E. G. London.
Reference catalogue of current literature. London, 1874. 8vo.
- AMMEN, S. Z. (*The Author.*) Baltimore.
Latin grammar for beginners. New York, 1876. 8vo.
- ASTOR LIBRARY. New York.
Astor Library annual reports. Albany, 1850-1876. 8vo.
- AUSTEN, P. T. (*The Author.*)
Kurze Einleitung zu den aromatischen Nitroverbindungen. Berlin, 1876. 8vo. pph.
Ueber Dinitroparadibrombenzole. Berlin, 1876. 8vo.
- AVERY, JOHN. (*The Author.*) Professor of Languages, Iowa College. Grinnell, Iowa.
Contributions to the history of verb-inflection in Sanskrit. [New Haven. 1875.] 8vo.
- BALTIMORE, (SCHOOL COMMISSIONERS OF.)
Reports of the Board of School Commissioners of Baltimore. 1870-1875. 6 v. Baltimore, 1870-75. 8vo.
- BARBEE, W. J. (*The Author.*) Professor, Ghent College. Ghent, Kentucky.
First principles of geology. Louisville, 1868. 12mo.
- BASCOM, JOHN. (*The Author.*) President of the University of Wisconsin. Madison, Wisconsin.
Philosophy of religion. New York, 1876. 8vo.
- BILLINGS, J. S., M. D. (*The Author.*) Washington, D. C.
Specimen fasciculus of a catalogue of the National Medical Library Washington, 1876. 4to. pph.

BLAND, THOMAS. New York.

ADAMS, C. B., *Catalogue of shells collected at Panama*. New York, 1862. 4to.

BLASIUS, WILLIAM. (*The Author.*)

Storms; their nature, classification and laws. Philadelphia, 1875. 8vo.

BOLTON, H. C. (*The Author.*) Associate Professor of Chemistry, School of Mines, Columbia College. New York.

Index to the literature of manganese, (1596-1875.) Salem, 1876. 8vo.

Index to the literature of uranium. Salem, 1870. 8vo.

BOSTON SOCIETY OF NATURAL HISTORY. (At the request of the Centennial Commissioner for Massachusetts.)

CROSBY, W. C., *Report on the geological map of Massachusetts*. Boston, 1876. 8vo.

BROWNE, R. H. New York.

MONTGOMERY, JAMES, *Sacred poems and hymns*. New York. 1854. 12mo.

BRUSH, G. J. Professor of Mineralogy, Sheffield Scientific School, Yale College. New Haven, Ct.

Reports of the Sheffield Scientific School, (1866-1875.) New Haven, 1866-1875. 8vo.

CLARK, J. G. (*The Author.*) Professor, William Jewell College. Liberty, Mo.

Elements of the infinitesimal calculus. New York, (1875.) 8vo.

CLARKE, F. W. (*The Author.*)

Constants of nature. Washington, 1873-76. 4 Parts. 8vo.

CHESTON, GALLOWAY. Baltimore.

RIVERS, W. J. *A chapter in the early history of South Carolina*. Charleston, 1874. 8vo.

CHISHOLM, J. J., M. D. Baltimore.

LABORDE, M., *History of the South Carolina College*. Charleston, 1874. 8vo.

CHASE, P. L. (*The Author*) Professor of Philosophy, Haverford College. West Haverford, Pa.

On some fundamental propositions of central force. [Philadelphia, 1876.] 8vo. ppb.

COLIN, ALFRED. (*The Author.*) New York.

Universal metric system. New York, 1876. 8vo.

COOPER, ELLWOOD. (*The Author.*) Santa Barbara, Cal.

Forest culture and eucalyptus trees. San Francisco, 1876. 12mo.

CUSHINGS & BAILEY. Baltimore.

Baltimore handbook of colleges, schools, libraries, etc. Baltimore, 1876.
12mo.

Trade list annual for 1875. New York, 1875. 8vo.

" " " " 1876. " 1876. "

DALE, T. N. (*The Author.*) Paterson, N. J.

Rhaetic strata of the Val di Ledro. Paterson, 1876. 8vo. pph.

DAVIS, Hon. A. B. Montgomery County, Md.

Book of common prayer. [1728.] 8vo. [*No title*]

BATES, E., *Christian politics.* London, 1806. 8vo.

BURGH, J., *Political disquisitions.* Vol. I. Philadelphia, 1775. 8vo.

CARE, H., *English liberties.* London, 1719. 8vo.

Constitution of the United States. Philadelphia, 1791. 12mo.

HERTY, T., *Digest of the laws of Maryland.* Baltimore, 1799. 8vo.

JONES, F. C., *New pocket conveyancer.* 2 v. Dublin, 1794. 12mo.

Laws of Maryland, [1634-1763,] ed. T. Bacon. Annapolis, 1765. fol.
[1768-1785,] " 1787. "

ed. W. Kilty. 2 v. Annapolis, 1799-1800. 4to.

Laws of the United States. 3 v. Philadelphia, 1796. 12mo.

SMITH, ADAM, *Wealth of nations.* 3d ed. 3 v. London, 1784. 8vo.

Trial of Hon. Samuel Chase. Baltimore, 1805. 8vo.

DECANVER, H. C. (*The Author.*)

Catalogue of works in refutation of Methodism. New York, 1868. 8vo.

DE FOREST, E. L. (*The Author.*) Watertown, Ct.

Interpolation and adjustment of series. New Haven, 1876. 8vo. pph.

DONALDSON, S. C. Baltimore.

MEYER, LEO, *Vergleichung der griechischen und lateinischen Declination.*
Berlin, 1862. 8vo.

DONALDSON, W. A.

Notes on Portugal, by E. A. G. Philadelphia, 1876. 8vo.

DUBOIS, A. J. (*The Author.*) Professor of Civil and Mechanical
Engineering, Lehigh University. Bethlehem, Pa.

Elements of graphical statics. 2 v. New York, 1875. 8vo.

New method of graphical statics. New York, 1875. 8vo.

DURFEE, C. A. Astor Library, New York.

COLVIN, VERPLANCK. *Report of the topographical survey of the Adirondack wilderness, for 1873.* Albany, 1874. 8vo.

EDUCATION, U. S. COMMISSIONER OF. Washington, D. C.

Public libraries in the United States. Parts 1 and 2. Washington,
1876. 8vo.

LIST OF DONORS TO THE LIBRARY.

37

Reports of the Commissioner of Education. 1872-1874. 3 v. Washington, 1878-75. 8vo.

ELDREDGE & BRO. (*Publishers.*) Philadelphia, Pa.

GREGORY, D. S., *Christian ethics.* Philadelphia, 1875. 8vo.

FRIEDLÄNDER & SOHN. (*Publishers.*) Berlin, Prussia.

Bibliotheca historico-naturalis et mathematica. Berlin, 1874. 8vo.

FRIENDS' BOOK ASSOCIATION. Philadelphia.

Peace principles in the history of Pennsylvania. Philadelphia, 1876. 8vo.

GILMAN, PRESIDENT D. C., Baltimore.

American journal of science and arts. New Haven. 2d Series, 50 v. 8vo. 3d Series, Vols. I-II, 2 v., 8vo.

Année géographique, (L') Paris, 1863-73. 6 v. 12mo.

Bulletin de la société de géographie. 4^e série. Paris, 1851-58. 15 v. 8vo.

Geographisches Jahrbuch. Gotha, 1866-74. 4 v. 12mo.

GNEIST, R., *Englische Communalverfassung oder der Self-government.* Berlin, 1863. 2 v. 8vo.

Journal of the royal geographical society. London, 1831-54. 22 v. 8vo.

Mittheilungen aus Justus Perthes geographischer Anstalt, von A. Petermann. Gotha, 1855-74. 25 v. 4to.

O'CALLAGHAN, E. B., *Documentary history of New York.* Albany, 1850-51. 4 v. 8vo.

Reports of the United States coast survey. Washington, 1852-71. 14 v. 8vo. and fol.

Zeitschrift für allgemeine Erdkunde. Berlin, 1853-63. 12 v. 8vo.

Also ninety-five volumes not enumerated.

GURNEY, MRS. ELIZA P. Burlington, N. J.

BRAITHWAITE, J. B., *Memoirs of Joseph John Gurney.* 2 v. Philadelphia, (1854.) 8vo.

GURNEY, J. J., *Essays on the evidences, etc. of Christianity.* Philadelphia, 1856. 8vo.

Hints on the portable evidences of Christianity. Philadelphia, 1858. 8vo.

Views and practices of the Society of Friends. New York, 1869. 8vo.

Thoughts on habit and discipline. Philadelphia, 1871. 12mo.

HALLOWELL, BENJAMIN. (*The Author.*) Sandy Springs, Md.

Geometrical analysis. Philadelphia, 1872. 8vo.

HINRICHS, GUSTAVUS. (*The Author.*) Professor of Chemistry, University of Iowa. Grinnell, Iowa.

Principles of chemistry. Davenport, Iowa, 1874. 8vo.

HOLT, HENRY. (*Publisher.*) New York.

ADAMS, C. K., *Democracy and monarchy in France.* New York, 1875. 8vo.

ALBEMARLE, (GEORGE THOMAS,) EARL OF. *Fifty years of my life* New York, 1875. 8vo.

ARNOLD, MATTHEW, *Essays in criticism.* New York, 1876. 12mo.
God and the bible. " " "
Literature and dogma. " " "

AUERBACH, BERTHOLD, *Black Forest village stories*, tr. by U. Goepp. New York, 1874. 16mo.

Edelweiss, tr. by Ellen Frothingham. New York, 1874. 16mo.

German tales. New York, 1874. 16mo.

Joseph in the snow. " " "

Little barefoot, tr. by E. B. Lee. New York, 1874. 16mo.

On the heights, tr. by S. A. Stern. New York, 1876. 12mo.

Villa on the Rhine, tr. by J. Davis. 2 v. New York, 1874. 16mo.

Waldfried, tr. by S. A. Stern. New York. 1874. 12mo.

AUSTIN, JOHN, *Lectures on jurisprudence*, abr. by R. Campbell. New York, 1875. 8vo.

BALDWIN, J. L., *Laws of short whist.* New York, 1875. 16mo.

BARRETT, E., *Carlyle anthology.* " 1876. 8vo.

BRINTON, D. G., *Myths of the new world.* " " 12mo.

Religious sentiment. " " "

CALVERLEY, C. S., *Fly leaves.* New York, 1878. 16mo.

CARLIER, AUGUSTE, *Marriage in the United States*, tr. by B. G. Jeffries. New York, 1867. 16mo.

CHESNEY, C. C., *Military biography.* New York, 1874. 12mo.

CHORLEY, H. G., *Recent art and society.* New York, 1874. 12mo.

COLERIDGE, S. T., *Biographia literaria.* 2 v. New York, 1872. 8vo.

College hymnal. New York, 1876. 16mo.

CONWAY, M. D., *Earthward pilgrimage.* New York, 1874. 8vo.

Sacred anthology. " " "

COQUEREL, ATHANASE, *Historical transformations of Christianity*, tr. by E. P. Evans. Boston, 1876. 12mo.

Critical and social essays reprinted from the Nation. New York, 1867. 16mo.

DEUTSCH, EMANUEL, *Literary remains of.* New York, 1874. 8vo.

DICKENS, CHARLES, *Our mutual friend*, condensed by R. Johnson. New York, 1876. 16mo.

DROZ, G., *Around a spring.* New York, 1876. 16mo.

Babolin. New York, 1876. 16mo

- FISKE, JOHN, *Tobacco and alcohol*. New York, 1869. 16mo.
- GAUTIER, THÉOPHILE, *Constantinople*, tr. by R. H. Gould. New York, 1875. 12mo.
A winter in Russia, tr. by M. M. Ripley. New York, 1875. 12mo.
- GREG, W. R., *Enigmas of life*. New York, 1876. 12mo.
Literary and social judgments. New York, 1876. 12mo.
- HADLEY, JAMES, *Essays, philological and critical*. New York, 1873. 8vo.
- HARDY, THOMAS, *Desperate remedies*. New York, 1874. 16mo.
Far from the madding crowd. New York, 1874. 16mo.
Hand of Ethelberta. New York, 1876. 16mo.
Pair of blue eyes. New York, 1874. 16mo.
Under the greenwood tree. New York, 1873. 16mo.
- HEDGE, F. H., *Essays and reviews*. New York, 1874. 8vo.
- HEINE, HEINRICH, *Book of songs*, tr. by C. G. Leland. New York, 1874. 16mo.
Pearls from. Philadelphia, 1865. 4to.
Scintillations from prose works of, tr. by S. A. Stern. New York, 1873. 16mo.
- HERTZ, HENRIK, *King René's Daughter*, tr. by F. Martin. New York, 1870. 16mo.
- HOUGHTON, LORD, (Milnes R. M.) *Monographs, personal and social*. New York, 1873. 12mo.
- HURD, F., *Milton anthology*. New York, 1876. 12mo.
- JONES, C. H., *Abridgement of the debates of congress, (43d Congress, 2d Session.)* New York, 1875. 8vo.
Africa. New York, 1875. 8vo.
- KALEVALA, *Selections from*, tr. by J. A. Porter. New York, 1873. 16mo.
- KOEHLER, AUGUST, *Practical botany*. New York, 1876. 12mo.
- LESSING, G. E., *Nathan the wise*, tr. by Ellen Frothingham. New York, 1873. 16mo.
- MAINE, H. S., *Ancient law*. New York, 1871. 8vo.
Early history of institutions. New York, 1875. 8vo.
Village communities in the east and west. New York, 1876. 8vo.
- MARTINEAU, HARRIET, *Biographical sketches*. New York, 1869. 8vo.
- JAMES, *Essays philosophical and theological*. 2 v. New York, 1875. 8vo.
New affinities of faith. Boston, 1869. 12mo.
- MILL I. S., *Autobiography*. New York, 1874. 8vo.
Dissertations and discussions. 5 v. New York, 1874-75. 8vo.
Examination of Sir Wm. Hamilton's Philosophy. 2 v. New York, 1874. 8vo.

- MILL, J. S., *His life and works*, by Spencer, Fawcett, [et al.] New York, 1878. 12mo.
- On Liberty. Subjection of woman.* New York, 1871. 8vo.
- Positive philosophy of Auguste Comte.* New York, 1875. 8vo.
- Representative government* New York, 1875. 8vo.
- Three essays on religion.* New York, 1874. 8vo.
- MORELET, ARTHUR, *Travels in Central America*, tr. by M. F. Squier. New York, 1871. 12mo.
- MOSCHELES, IGNATZ, *Recent music and musicians*, tr. by A. D. Coleridge. New York, 1875. 12mo.
- PACKARD, A. S. JR., *Guide to the study of insects.* New York, 1876. 8vo.
- Life histories of animals.* New York, 1876. 8vo.
- PUMPELLY, RAPHAEL, *Across America and Asia.* New York, 1871. 8vo.
- SAINT BEUVE, C. A., *English portraits.* New York, 1875. 12mo.
- SCOTT, SIR WALTER, *Ivanhoe*, condensed by R. Johnson. New York, 1876. 16mo.
- SMITH, HORACE and JAMES, *Rejected addresses.* New York, 1876. 16mo.
- STAHR, ADOLPH, *Life and works of Lessing*, tr. by E. P. Evans. 2 v. New York, 1873. 8vo.
- STILLMAN, W. J., *Cretan insurrection of 1866-68.* New York, 1874. 12mo.
- STRAUSS, D. F., *The old faith and the new*, tr. by M. Blind. New York, 1874. 12mo.
- SUMNER, W. G., *History of American currency.* New York, 1876. 12mo.
- TAINÉ, HENRI, *Ancient regime*, tr. by J. Durand. New York, 1876. 12mo.
- History of English literature*, tr. by H. Van Laun. 8v. New York, 1876. 12mo.
- Italy—Florence and Venice*, tr. by J. Durand. New York, 1875. 12mo.
- Italy—Rome and Naples*, tr. by J. Durand. New York, 1875. 12mo.
- Lectures on art*, tr. by J. Durand. 2 v. New York, 1875. 12mo.
- Notes in England*, tr. by W. F. Roe. New York, 1876. 12mo.
- Notes in Paris*, tr. by J. A. Stevens. New York, 1876. 12mo.
- On intelligence*, tr. by F. D. Haye. 2 v. New York, 1875. 12mo.
- Tour through the Pyrenees*, tr. by J. S. Fiske. New York, 1876. 12mo.

LIST OF DONORS TO THE LIBRARY. 41

TEGNÉR, ESAIAS., *Frithiof's Saga*, ed. Bayard Taylor. New York, 1875. 16mo.

TURGENIEFF, J. S., *Dimitri Roudine*. New York, 1873. 16mo.
Fathers and sons, tr. by E. Schuyler. New York, 1872. 16mo.

Liza, tr. by W. R. S. Ralston. New York, 1876. 16mo.

On the eve, tr. by C. E. Turner. New York, 1875. 16mo.

Smoke, tr. by W. F. West. New York, 1873. 16mo.

Spring floods, Lear, tr. by W. H. Browne. New York, 1874. 16mo.

TYLOR, E. B., *Primitive culture*. 2 v. New York, 1874. 8vo.

WAGNER, RICHARD, *Art life and theories*, tr. by E. L. Burlinghame. New York, 1875. 12mo.

WALKER, F. A., *Wages question*. New York, 1876. 8vo.

WEEKS, R. K., *Episodes and lyric pieces*. New York, 1870. 16mo.
Twenty pieces. New York, 1876. 16mo.

WINTHROP, THEODORE, *Canoe & saddle*. New York, 1876. 16mo.

Cecil Dreeme. New York, 1876. 16mo.

Edwin Brothertoft. New York, 1876. 16mo.

John Brent. New York, 1876. 16mo.

Life in the open air. New York, 1876. 16mo.

HOTCHKISS, JED. Staunton, Va.

Virginia. A geographical and political summary. Richmond, 1876. 8vo.

HUNT, PROF. T. S. (*The Author*.) Boston, Mass.

Chemical and geological essays. Boston, 1875. 8vo.

HURD & HOUGHTON. (*Publishers*.) New York.

PICKERING, E. G., *Elements of physical manipulation. Part II*. New York, 1876. 8vo.

ILES, M. W. Baltimore.

Catalogue of books and pamphlets in the Library of School of Mines, Columbia College. New York, 1875. 8vo.

INDIA OFFICE. London.

ANDERSON, ROBERT, *Tamul grammar*. London, 1821. 4to.

Anvār-i Suhelī. ed. J. W. J. Ouseley. Hertford, 1851. 4to.

BÜHLER, G., *Catalogue of Sanskrit Mss in Gujarāt, etc*. Bombay, 1871-73. 8vo.

CAMPBELL, A. D., *Dictionary of the Telooogo language*. Madras, 1848. 8vo.

HALL, FITZ EDWARD, *Bibliography of Indian philosophical systems*. Calcutta, 1859. 8vo.

- JAESCHKE, H. A., *Grammar of the Tibetan language*. Kye-lang, 1865. 8vo.
Tibetan and English dictionary. Kye-lang, 1866. 8vo.
- McKERRELL, JOHN, *Grammar of the Carnatica language*. Madras, 1820. fol.
- Mánava-Kalpa-Sútra. ed. T. Goldstücker. London, 1861. 8vo.
- MEERZA MOHAMMAD IBRAHEEM. *Grammar of the Persian language*. London, 1841. 8vo.
- MOLESWORTH, J. T., *Maráthi and English dictionary*. Bombay, 1857. fol.
- Prákrita-prakása. ed. E. B. Cowell. Hertford, 1854. 8vo.
- PRATAPACHANDRA GHOSHA. *Durga Puja*. Calcutta, 1871. 8vo.
- Rig-Veda-Sanhita. ed. by F. M. Müller. London, 1854-74. 5 v. 4to.
 tr. " " Vol. I. London, 1869. 8vo.
 tr. by H. H. Wilson. 4 v. " 1866. 8vo.
- Sakuntalá. ed. M. Williams. Hertford, 1853. 8vo.
- SPRENGER, ALOYS, *Catalogue of the libraries of the King of Oudh*. Vol. I. Calcutta, 1854. 8vo.
- STRANGE, SIR THOMAS, *Hindu law*. Vol. I. London, 1830. 8vo.
- TAYLOR, WILLIAM, *Catalogue of Oriental Mss. in library of Fort St. George*. 8 v. Madras, 1857-62. 8vo.
- White Yajurveda*. ed. A. Weber. 3 v. Berlin, 1852-59. 4to.
- WILLIAMS, MONIER, *Dictionary of English and Sanskrit*. London, 1861. 4to.
- WILSON, H. H., *Glossary of Indian terms*. London, 1855. 4to.

INTERIOR, DEPARTMENT OF THE. Washington, D. C.

- American archives*, ed. Peter Force. 4th & 5th Series. 3 v. 1844-53. fol.
- American state papers*. 2nd Series. 17 v. Washington, 1860-61. fol.
- COPE, E. D., *Vertebrata of the cretaceous formations of the west*. Washington, 1875. 4to.
- PACKARD, A. S. Jr., *Monograph of the geometrid moths*. Washington, 1876. 4to.

JAPANESE DEPARTMENT OF EDUCATION.

- Educational documents*. 38 vols. 28 charts.
- History of Japanese education*. New York, 1876. 12mo. pph.

JENKINS, T. N. Rear Admiral, U. S. Navy.

- Catalogue of the Navy Department exhibits at the International Exhibition, 1876*. Philadelphia, 1876. 4to.

JOHNS HOPKINS HOSPITAL. Baltimore.

- Hospital construction and organization*. New York, 1875. 8vo.
- Plans for the Johns Hopkins Hospital and Colored Orphan Asylum*. New York, 1875. 8vo.

JOHNSON, REVERDY. Baltimore.

- BÄHR, J. C. F., *Geschichte der römischen Literatur*. 2 v. Carlsruhe, 1844-45. 8vo.
- BERGIUS, C. J., *Preussen*. Münster, 1843. 8vo.
- EICHHORN, K. F., *Grundsätze des Kirchenrechts*. Göttingen, 1831-33. 2 v. 8vo.
- GOETHE, J. W., *Poetische und prosaische Werke*. 2 v. Stuttgart, 1836-37. 8vo.
- HEGEL, G. W. F., *Encyclopädie der philosophischen Wissenschaften*, hrsg. von L. Henning & C. L. Michelet. 2 v. Berlin, 1843. 8vo.
- Philosophie der Geschichte*, hrsg. von E. Gans. Berlin. 1840. 8vo.
- Philosophie des Rechts*, hrsg. von E. Gans. Berlin, 1840. 8vo.
- Wissenschaft der Logik*, hrsg. von L. Henning. 3 v. Berlin, 1841. 8vo.
- KANT, IMMANUEL, *Werke*. 5 v. Leipzig, 1838-39. 8vo.
- M'ADAM, J. L., *Remarks on the present system of road-making*. Baltimore, 1821. 8vo.
- MENZEL, WOLFGANG, *Geschichte der Deutschen*. Stuttgart, 1843. 8vo.
- NEANDER, AUGUST, *Geschichte der Pflanzung der christlichen Kirche durch die Apostel*. Hamburg, 1838. 8vo.
- RANKE, LEOPOLD, *Die römischen Päpste*. 3 v. Berlin, 1839-44. 8vo.
- RAUMER, F., *Geschichte der Hohenstauffen*. 6 v. Leipzig, 1840-42. 8vo.
- SCHLOSSER, F. C., *Geschichte des 18ten Jahrhunderts*. 5 v. Heidelberg, 1843-44. 8vo.
- SHAKSPERE, WILLIAM, *Dramatic works*. 2 v. London. 8vo. s. a.
- WALTER, FERDINAND, *Geschichte des römischen Rechts*. 2 v. Bonn, 1845-46. 8vo.
- Lehrbuch des Kirchenrechts*. Bonn, 1842. 8vo.
- WALSH, ROBERT, *Appeal from the judgments of Great Britain*. Philadelphia, 1819. 8vo.
- WERDER, KARL, *Logik*. Berlin, 1841. 12mo.

JONES, C. C. (*The Author.*) New York.

- Antiquities of the southern indians*. New York, 1873. 8vo.
- Memoir of Sergeant Wm. Jasper*. Albany, 1876. 8vo. pph.
- Reminiscences of Gen. Henry Lee*. Albany, 1870. 4to.
- Siege of Savannah, 1779*. Albany, 1874. fol.
- Sketch of Tomo Chi Chi*. Albany, 1868. 8vo.

KERR, W. C. (*The Author.*) State Geologist of North Carolina.

- Report of the geological survey of North Carolina. Vol. I.—Physical geography, etc.* Raleigh, 1875. 8vo.

KROEH, C. F. (*The Author.*) Professor of Modern Languages,
Stevens Institute of Technology. Hoboken, N. J.

First German reader. New York, 1876. 12mo.

LAGARDE, ERNEST. Professor of Modern Languages, Mount St.
Mary's College. Emmittsburg, Md.

French verb book, by E. Lagarde. Philadelphia, 1878. 12mo.

QUINTON, M. A., *Nobleman of '89*, tr. from the French by Prof. E.
Lagarde. Baltimore, 1874. 8vo.

LEVERSON, M. R. (*The Author*) Denver, Col.

Common sense; or, first steps in political economy. New York, 1876,
12mo.

LINCOLN, D. F., M. D. (*The Author.*) Boston Dispensary, Boston.

Electro-therapeutics. Philadelphia, 1874. 8vo.

LIPPINCOTT, J. B. & CO. (*Publishers.*) Philadelphia.

WRIGHT, R. J., *Principia, or basis of social science.* Philadelphia,
1875. 8vo.

LOCKINGTON, W. N. (*The Author*) San Francisco, Cal.

Crustacea of the Pacific coast. [San Francisco,] 1876. 8vo.

List of echinidae in collection of Cal. Acad. of Nat. Sciences, May, 1875.
[San Francisco,] 1875. 8vo.

New genus and species of colubrine snake. [San Francisco,] 1876. 8vo.

New genus and species of decapod crustacean. " " " "

New genus and three new species of sessile eyed crustacea. [San Fran-
cisco,] 1876. 8vo.

Seventeen new species of crustacea. [San Francisco,] 1876. 8vo.

LYMAN, D., JR. (*The Translator.*)

Moral Sayings of Publius Syrus. New York, (1862.) 12mo.

MACBETH, PROF. J. W. V. (*The Author.*)

Might and mirth of literature. New York, 1875. 8vo.

MACMILLAN & CO. (*Publishers.*) New York and London.

JEVONS, W. S., *Elementary lessons in logic.* London, 1876. 12mo.

MCIPHERSON, HON. EDWARD. (*The Author.*) Gettysburg, Pa.

Handbook of politics for 1876. Washington, 1876. 8vo.

MARYLAND HISTORICAL SOCIETY. Baltimore.

CARROLL, CHARLES OF CARROLLTON, *Journal of.* Baltimore, 1876. 8vo.

MAURICE, PROF. B. (*The Author*)

Le grammaire en action. Philadelphia, 1873. 12mo.

MERRIMAN, MANSFIELD. (*The Author.*) Instructor in Civil Engineering, Sheffield Scientific School, Yale College. New Haven, Ct. *Theory and calculation of continuous bridges.* New York, 1876. 12mo.

MITCHELL, REV. THOMAS. (*The Author.*) Brooklyn, N. Y. *Phonetic and stenographic shorthand.* New York, 1876. 12mo.

MORSE, PROF. E. S. (*The Author.*) Salem, Mass. *First book of zoölogy.* New York, 1875. 8vo.

MURPHY, JOHN & CO. (*Publishers.*) Baltimore.

JENKINS, O. L., *Handbook of British and American literature.* Baltimore, 1876. 12mo.

TYLER, SAMUEL, *Memoir of R. B. Taney.* Baltimore, 1872. 8vo.

MURRAY, NICHOLAS. New York.

CARROLL, B. R., *Historical collections of South Carolina.* 2 v. New York, 1836. 8vo.

DUER, W. A., *Life of Lord Stirling.* New York, 1847. 8vo.

EVERETT, EDWARD, *Life of Washington.* New York, 1860. 8vo.

GAYLEY, J. F., *History of Jefferson Medical College.* Philadelphia, 1858. 4to.

HILDRETH, RICHARD, *Theory of politics.* New York, 1853. 8vo.

JAEGER, B., *North American insects.* New York, 1859. 8vo.

LAMARTINE, A. DE, *Voyage en Orient.* Paris. s. a. 8vo.

LEWES, G. H., *Studies in animal life.* New York, 1860. 8vo.

LOOMIS, ELIAS, *Recent progress of astronomy.* New York, 1856. 8vo.

M'COSH, JAMES and DICKIE, GEORGE, *Typical forms and special ends in creation.* Edinburgh, 1857. 8vo.

MAURY, M. F., *Physical geography of the sea.* New York, 1855. 8vo.

New Jersey Historical Society, Proceedings. (1847-76.) 4 v. Newark. 8vo.

NEWTON, SIR ISAAC, *Principia*, ed. J. M. F. Wright. Cambridge, 1830. 8vo.

RUSH, BENJAMIN, *Diseases of the mind.* Philadelphia, 1812. 8vo.

SEDGWICK, THEODORE, *Memoir of William Livingston.* New York, 1833. 8vo.

TOCQUEVILLE, A. C. H. C. DE, *Old regime and the revolution.* New York, 1856. 8vo.

United States: Reports and Official Documents. 49 vols.

WILLIAMS, J. S., *History of the invasion and capture of Washington.* New York, 1857. 8vo.

WILSON, R. A., *History of the conquest of Mexico.* Philadelphia, 1859. 8vo.

MURRAY, T. C. Baltimore.

BROOK, BENJAMIN, *Lives of the puritans* 3 v. London, 1818. 8vo.

MURRAY, REV. NICHOLAS, *Letters to Right Rev. John Hughes*, by Kirwan. Edinburgh, 1851. 12mo.

Men and things as I saw them in Europe. New York, 1854. 8vo.

Notes on Elizabethtown. Elizabethtown, N. J., 1844. 8vo.

Parish and other pencillings. New York, 1854. 8vo.

Preachers and preaching. New York, 1860. 8vo.

Romanism at home. Edinburgh, 1852. 12mo.

SPRAGUE, W. B., *Annals of the American pulpit.* 9 v. New York, 1857-69. 8vo.

VAMBÉRY, ARMINIUS, *Der Islam im 19ten Jahrhundert.* Leipzig, 1875. 8vo.

NASON, H. B., Professor, Rensselaer Polytechnic Institute.
Troy, N. Y.

Proceedings at the semi-centennial anniversary of the Rensselaer Polytechnic Institute. Troy, 1875. 8vo.

NEILL, E. D., D. D. (*The Author.*) Minneapolis, Minn.

English colonization of America during the 17th century. London, 1871. 8vo.

Foot prints of civilization in the valley of the Mississippi. Philadelphia, 1873. 8vo.

Terra Marix. Philadelphia, 1867. 8vo.

NEWCOMB, SIMON. (*The Author.*) Professor of Mathematics, U. S. Naval Observatory. Washington, D C.

Investigations of the corrections to Hansen's tables of the moon. Washington, 1876. 4to.

NEWELL, M. A. Superintendent of the Public Schools of Maryland.

Report of the public schools of Maryland, 1872-74. 3 v. Annapolis, 1873-75. 8vo.

PECH, JAMES (*The Author.*) New York.

Beethoven centennial. New York, 1870. 8vo.

Influence of liberty on taste. New York, 1869. 8vo.

PEYTON, J. L. (*The Author.*)

Biographical sketch of Anne M. Peyton. Guernsey, 1876. 8vo. pph.

Memoir of William A. Peyton, of Roanoke. London, 1878. 8vo.

Over the Alleghanies and across the prairies. London, 1870. 8vo.

PORTER, MRS. BURR. Boston, Mass.

(In commemoration of P. Porter Poinier, a Fellow of the University.
† June 11th, 1876.)

British Association reports. 43 v. London, 1831-74. 8vo.

POINIER, P. P., *Formulae for the apparent specific heat of saturated vapors.* Philadelphia, 1875. 8vo.

PORTER & COATES. (*Publishers.*) Philadelphia.

THOMPSON, R. E., *Social science and national economy.* Philadelphia, 1875. 8vo.

RABILLON, PROF. LÉONCE. (*The Translator.*) Baltimore.

Le livre de merveilles par N. Hawthorne. 2 v. Paris, 1865-67. 12mo.

RICE, J. M., Professor of Mathematics, U. S. Navy, and

JOHNSON, W. W., Professor of Mathematics, St. John's College,
Annapolis, Md. (*The Authors.*)

Differentials of functions. New York, 1875. 12mo. pph.

Elements of differential calculus. Part I. New York, 1874. 8vo.

RICKETS, P. DE P. (*The Author.*) Instructor, School of Mines, Columbia College. New York.

Notes on assaying. New York, 1876. 8vo.

RODGERS, C. R. P., Rear Admiral, U. S. N. Superintendent of the
U. S. Naval Academy. Annapolis, Md.

Problems in physics and chemistry. Washington, 1876. 8vo.

RICE, J. M. and JOHNSON, W. W., *Elements of differential calculus.*
Part II. Washington, 1875. 8vo.

SOLEY, J. R., *Historical Sketch of the U. S. Naval Academy.* Washington, 1876. 8vo.

ROWLAND, PROF. H. A. (*The Author.*) Baltimore.

Maximum permeability of iron, steel, nickel, and cobalt. [London, 1873.]
8vo. 2 pphs.

SAUVEUR, LAMBERT. (*The Author.*) Boston, Mass.

Petites causeries. Boston, 1875. 8vo.

SCHMIDT, L. W. New York.

Deutsches akademisches Jahrbuch für 1875. Leipzig, 1875. 12mo.

SKINNER, J. J. (*The Author.*) Instructor in Mathematics, Sheffield Scientific School, Yale College. New Haven.

Principles of approximate complications. New York, 1876. 12mo.

SMITH, G. W. (*The Author.*) Late Insurance Commissioner of Kentucky. New York.

Notes on life insurance. New York, 1876. 8vo.

SMITH, PROF J. L. (*The Author.*) Louisville, Kentucky.

Description d'une masse de fer météorique, etc. Paris, 1873-75. 4to. 7 pphs.

Mineralogy and chemistry. Louisville, 1873. 8vo.

SMITHSONIAN INSTITUTION. Washington, D. C.

POWELL, J. W., *Exploration of the Colorado river of the west.* 1869-72. Washington, 1875. 4to.

SMYTHE, G. A. (*The Author.*)

Schwefelverbindungen. Berlin, 1876. 8vo.

SOUTH CAROLINA, (COLLEGE OF)

LA BORDE, M., *History of the South Carolina College.* Columbia, 1859. 8vo.

SOUTH CAROLINA, (STATE OF)

LA BORDE, M., *History of the South Carolina College.* Columbia, 1859. 8vo.

SPARKS, MRS. JARED. Cambridge, Mass.

American journal of science, 3rd Series. Vols. III-XI. 9 v. New Haven, 1872-76. 8vo.

Catalogue of the library of Jared Sparks. Cambridge, 1871. 8vo.

ELLIS, G. E., *Memoir of Jared Sparks.* " 1869. "

Harvard, Class of 1873. Baccalaureate sermon, oration and poem. Boston, 1873. 8vo.

North American review. Vols. XLII-CXXI. 80 v. Boston, 1836-75. 8vo.

PEABODY, A. P., *What the physician should be.* Cambridge, 1870. 8vo.

Report of the French relief fund. Boston, 1872. 8vo.

SPARKS, JARED, *Letter to Lord Mahon.* Boston, 1852. 8vo.

Remarks on reprint of original letters from Washington to Joseph Reed. Boston, 1853. 8vo.

SYLVESTER, PROF. J. J. (*The Author.*) Baltimore.

Theory of syzygetic relations. London, 1853. 4to.

Algebraical equations. A trilogy. London, 1865. 4to.

TERQUEM, ÉMILE. Paris.

Les modèles, cartes, et dessins réunis par les soins du ministère des travaux. Paris, 1876. 8vo.

Models, charts, and drawings collected by the ministry of public works. Paris, 1876. 8vo.

LIST OF DONORS TO THE LIBRARY.

49

TYLER, A. W. Baltimore.

Annual report of the Astor Library, 1875-76 Albany, 1876. 8vo. pph.
Index of books in the Bates hall of the Public Library of the City of Boston. First Supplement. Boston, 1866. 8vo.

UHLER, P. R. (*The Author.*) Baltimore.

List of the hemiptera of the region west of the Mississippi river. Washington, 1876. 8vo.

VAN NAME, PROF. ADDISON. Librarian of Yale College.
 New Haven, Ct.

Catalogue of the Linonian and Brothers' Library, Yale College. New Haven, 1873. 8vo.

WHEELER, G. M. Lieutenant, U. S. Engineers.

Report of surveys west of the 100th meridian. Vols. III. & V. 2 v. Washington, 1875. 4to.

WILLIAM AND MARY, (COLLEGE OF.) Williamsburg, Va.

History of the College of William and Mary. Richmond, 1874. 8vo.

WOODWORTH, J. M., M. D. Washington, D. C.

Annual report of the supervising surgeon of the marine hospital service of the U. S. Washington, 1874. 8vo.

Cholera epidemic of 1873 in the U. S. Washington, 1875. 8vo.

WRIGHT, REV. W. J. (*The Author.*)

Determinants. London, 1875. 8vo.

WRIGHT, W. T. U. S. Consul. Santos, Brazil.

The empire of Brazil at the Exposition of 1876 in Philadelphia. Rio de Janeiro, 1876. 8vo.

D.

Additional Charter Powers.

AN ACT to grant certain additional powers to the "JOHNS HOPKINS UNIVERSITY," a corporation incorporated under the General Laws of Maryland.

SECTION 1. *Be it enacted by the General Assembly of Maryland,* That "THE JOHNS HOPKINS UNIVERSITY," a corporation duly incorporated by certificate, recorded in the office of the Clerk of the Circuit Court for Baltimore County, shall have powers to establish branches of the said University in the City of Baltimore, to hold, or to purchase and hold, all property in said City, needed for the successful conducting of the branches of the said University in said City, and to keep and maintain a principal office in said City for the conduct of the business of the said University.

SECTION 2. *And be it enacted,* That the said "THE JOHNS HOPKINS UNIVERSITY," shall have power to admit students of the said University, who shall merit the distinction to the office and profession of Surgeon, or to the degree of Doctor of Medicine, or of Doctor of Laws, or of Bachelor, or Master of Arts; to grant to students in such University, such certificates of proficiency and attainments in any special study, as the said University may see proper to confer; and to grant the honorary degrees of Doctor of Laws, Doctor of Medicine, and Master of Arts, or such other degrees as may be proper, to any person who may merit such distinction, whether such person be a student of such University or not.

SECTION 3. *And be it enacted,* That this Act shall take effect from its passage.

APPROVED March 22, 1876.



JOHNS HOPKINS UNIVERSITY.

THIRD ANNUAL REPORT.

Baltimore, Maryland.

1878.

THIRD ANNUAL REPORT
OF THE
Johns Hopkins University,
Baltimore, Maryland,
1878.



BALTIMORE:
PRINTED BY JOHN MURPHY & Co.
182 BALTIMORE STREET.
1878.

CONTENTS.

	PAGE.
NAMES OF THE TRUSTEES,	iii
REPORT OF THE PRESIDENT :	
Review of the Fundamental Principles,	1
Distinction between Colleges and Universities,	9
Requisites of success,	10
Views of the Professors,	12
The System of Fellowships,	12
Methods of Instruction,	14
Work of the Scientific Laboratories,	15
Scientific Associations, (App., p. 54),	20
Provisions for the Youth of Baltimore,	21
Peculiarities of our Collegiate Work,	21
Choice of Seven Courses of Study,	22
Public Afternoon Lectures,	25
Publications of the University,	29
Relations with other Institutions,	30
Teachers' Class in Physiology,	33
Examinations and Degrees,	36
Commemoration Day,	39
The Library,	40
Gifts,	40
Death of Thomas M. Smith, a Trustee,	41
Appointment of Assistant Professors,	42
Summary of Attendance,	42
APPENDIX :	
A. Academic Staff,	45
B. List of Publications,	48
C. Chesapeake Zoölogical Laboratory,	49
D. Papers read before the Scientific Associations,	54
E. Donations to the Library,	57

TRUSTEES.

President.

GALLOWAY CHESTON.

Treasurer.

FRANCIS WHITE.

Secretary.

WILLIAM HOPKINS.

Members of the Board.

GEORGE WILLIAM BROWN,	WILLIAM HOPKINS,
GALLOWAY CHESTON,	REVERDY JOHNSON,
GEORGE W. DOBBIN,	FRANCIS T. KING,
JOHN W. GARRETT,	CHARLES MORTON STEWART,
CHARLES J. M. GWINN,	JAMES CAREY THOMAS,
LEWIS N. HOPKINS,	FRANCIS WHITE.

COMMITTEES.

1878.

Executive Committee:

REVERDY JOHNSON,	CHARLES J. M. GWINN,
JUDGE GEO. W. DOBBIN,	DR. JAMES C. THOMAS,
JUDGE GEO. WM. BROWN,	GALLOWAY CHESTON, <i>ex officio</i> .

Finance Committee:

JOHN W. GARRETT,	GALLOWAY CHESTON, <i>ex officio</i> .
FRANCIS WHITE,	

Building Committee:

JUDGE GEORGE W. DOBBIN,	LEWIS N. HOPKINS,
FRANCIS T. KING,	GALLOWAY CHESTON, <i>ex officio</i> .
THOMAS M. SMITH,	

Committee in Charge of the Clifton Grounds:

FRANCIS WHITE,	GALLOWAY CHESTON, <i>ex officio</i> .
REVERDY JOHNSON,	

❖

THIRD ANNUAL REPORT

OF THE

Johns Hopkins University.

*To the Trustees of the
Johns Hopkins University:*

GENTLEMEN :

At your annual meeting, January 7th, 1878, the third annual report of the President of the University was presented and read. Its publication was deferred, by your consent, that it might include a review of the work of the University during the first two years of instruction, and that hereafter each annual report might cover the period of an academic and not of a civil year. This enlarged report I now lay before you with such details as seem likely to be of interest and use to the members of the University or to the public at large, and with some preliminary observations which may serve to interpret the character of our undertaking to those who observe us from a distance.

It is desirable that the friends of this University, whether they are men of learning engaged

in the advancement of literature or science; or are citizens interested in the development of a public benefaction; or are parents planning for the education of their sons; or are teachers watching the growth of a new foundation, should clearly understand the principles which have governed the authorities in their administration of this trust; and in order that they may, it will be necessary to recur to some statements already made in other connections.

Our founder gave no limitations to his representatives in respect to the interpretation of the word "University." This term has been applied so differently in various parts of this country, and the University types differ so much in Europe, that it would not have been strange if serious diversities of opinion had arisen among us. Fortunately the Trustees have acted with complete unanimity.

From the beginning, they refused to be governed by personal, local, or sectarian predilections, and endeavored to carry out the generous purposes of the founder by organizing an institution which should aim at the highest good possible under the existing circumstances, and should thus be of benefit to all this land and even to the world of science and letters. They hoped that the public influence of the foundation would first be felt in Baltimore, next in the regions most closely connected with

this city, and finally, at a distance. They were in no haste for immediate results.

In studying the problem committed to them for solution, they soon perceived that there was no obvious call for another "college," using that word in the sense commonly given to it in the educational vocabulary of this country. A few students might doubtless be brought to Baltimore who would otherwise go to Princeton or the University of Virginia, or to some other neighboring institution, and thus the sentiments of rivalry or jealousy might be quickly developed; but there would be no advantage to literature, science or education from adopting such a course. There are already quite enough places in the Atlantic States, for the discipline of young men in the elements of a liberal education, and especially in those preliminary studies, linguistic and mathematical, which are characteristic of American colleges.

Again, there was no call for another technological or scientific school. Liberal benefactions, aided in many cases by the land-grant of the general government, have established within the last twenty-five years excellent foundations for the study of science in its applications to human industry,—schools of chemistry, engineering, mining, mechanics, agriculture and the like. There was even danger that in the struggle for life, many of these new schools would give way to the few which

are really strong. On the other hand, there seemed to be a demand for scientific laboratories and professorships, the directors of which should be free to pursue their own researches, while at the same time stimulating their students to prosecute study with a truly scientific spirit and aim.

When attention was given to the state of professional education,—it was clear that this was not the time or place to establish a theological department, however much might be said upon the advantages of providing for theological science in the university spirit, and of encouraging the study of Christian doctrine free from denominational or sectarian restrictions. In respect to the study of law and medicine, facilities were already afforded in Baltimore, closely corresponding with those which are enjoyed in other cities of this country; and although these facilities might doubtless be increased by liberal appropriations of money, there were good reasons for postponing any movement in this direction, while the University of Maryland, a corporation of age, dignity, and influence, was in possession of the field, giving lectures and instruction in both these departments; and while in medicine there were in Baltimore two other schools, (since combined) providing lectures and bestowing degrees. The establishment of a hospital by the founder of the University had indeed indicated his purpose to promote the advancement of medical

science,—but his Trustees early concluded that the methods to be adopted might be wisely left for future determination, when the hospital structure should approach completion. As an aid to these discussions, Dr. J. S. Billings, Surgeon, U. S. A., of Washington, who is the medical adviser of the Hopkins Hospital Trustees, was invited to give before the University, a course of lectures on Medical Education, and related topics. He did so in the autumn of 1877, and those portions of the lectures which seemed to have the greatest public interest have since been printed in a pamphlet.

Finally, a continuance of their inquiries led the Trustees to believe that there was a strong demand, among the young men of this country, for opportunities to study beyond the ordinary courses of a college or a scientific school; particularly, in those branches of learning not included in the schools of law, medicine and theology. The strongest evidence of this demand was afforded by the increasing attendance of American students upon the lectures of the German Universities. Another sign was given by the enrolment of "post graduates" not only at Harvard and Yale, where generous opportunities were given for graduate study, but also in colleges where the resident staff were thoroughly absorbed in their ordinary collegiate work, and were really not free and fresh for the syste-

matic guidance of graduate students. A third indication of the need of arrangements for advanced study was afforded by the great difficulty, (privately avowed in many of the best colleges), of obtaining superior professors as vacancies occur. There are always candidates enough,—candidates of intellectual and moral worth,—but the men of mark, who show that they are likely to advance the sciences they profess, and are likely to become recognized authorities among their peers at home and abroad, are very few. In Maryland, and many other parts of the country, south and west, there are chartered colleges, which may reasonably be expected to provide instruction in mathematical and classical studies,—but which cannot give in an efficient way, instruction in those branches of science which require costly apparatus, large libraries, scientific journals. There were indications that many young men would begin their higher studies in such colleges near to their own residences, and would afterwards come to Baltimore, if sufficient attractions were offered, for the prosecution of their work.

These considerations led to the conclusion that THE PHILOSOPHICAL FACULTY OF A UNIVERSITY, to give instruction of a superior character in mathematics, science and language, should be the first object of our care. To this department we hoped that students who had already been

taught in other colleges, would be drawn by the eminence of the professors and the excellent opportunities for advanced study to be afforded in Baltimore. The experience of two years has confirmed the wisdom of this decision.

At the same time, and with equal certainty, the Trustees were persuaded that the youth of Baltimore had particular claims upon the Hopkins foundation, and that they should not be compelled to go away from home, in order to be fitted to enter the new institution established at their doors. Fortunately in the Baltimore City College, instruction in mathematics was carried quite far enough for the ordinary student, and there were good opportunities to begin the study of languages and science. Arrangements were therefore made for the reception of graduates of the Baltimore City College, and of other scholars coming from the private schools of the city. Courses of study leading to the Baccalaureate degree were marked out for such students,—and certain special modifications of the traditional college were introduced, which have been regarded with favor in older institutions, and seem to be particularly well adapted to the needs and wishes of this community.

In determining to give prominence to the University rather than to the College, the Trustees were early led to the study of the best institutions of this and other countries. They informed themselves, by

prolonged interviews with the Presidents and by visits to several institutions, of the views which were held in the Universities of Cambridge, New Haven, Ithaca, Michigan, Pennsylvania, Virginia, and elsewhere. They were made acquainted with the drift of the educational discussions in Great Britain, Germany, Austria, France, and other European countries; and they determined not to follow exclusively any precedent,—not to attempt to found a German University or a French or an English,—but to derive from all sources such experience and recommendations as might be adapted to this country and lead in course of time to an American University based upon our own educational system, and fitted to meet the wants of our own scholars. Any one who will watch the development of the Hopkins plans will be likely to perceive peculiarities distinguishing this foundation from any other. But the authorities may also claim that there has been no seeking after novelty,—no desire to make experiments which have already been fairly tested and rejected,—no inclination to go counter to the experience and judgment of wise and successful teachers elsewhere,—no disposition to rival any other establishment. As a consequence of this policy, the interest and sympathy and in some cases the hearty coöperation of other institutions has been freely given to this.

The terms university and college have been so frequently interchanged in this country that their significance is liable to be confounded; and it may be worth while, once more at least, to call attention to the distinction which is recognized among us. By the college is understood a place for the orderly training of youth in those elements of learning which should underlie all liberal and professional culture. The ordinary conclusion of a college course is the Bachelor's degree. Usually, but not necessarily, the college provides for the ecclesiastical and religious as well as the intellectual training of its scholars. Its scheme admits but little choice. Frequent daily drill in languages, mathematics and science, with compulsory attendance and frequent formal examinations, is the discipline to which each student is submitted. This work is simple, methodical and comparatively inexpensive. It is understood and appreciated in every part of this country.

In the university more advanced and special instruction is given to those who have already received a college training or its equivalent, and who now desire to concentrate their attention upon special departments of learning and research. Libraries, laboratories and apparatus require to be liberally provided and maintained. The holders of professorial chairs must be expected and encouraged to advance by positive researches the

sciences to which they are devoted; and arrangements must be made in some way to publish and bring before the criticism of the world the results of such investigations. Primarily, instruction is the duty of the professor in a university as it is in a college; but university students should be so mature and so well trained as to exact from their teachers the most advanced instruction, and even to quicken and inspire by their appreciative responses the new investigations which their professors undertake. Such work is costly and complex; it varies with time, place and teacher; it is always somewhat remote from popular sympathy, and liable to be depreciated by the ignorant and thoughtless. But it is by the influence of universities, with their comprehensive libraries, their costly instruments, their stimulating associations and helpful criticisms, and especially their great professors, indifferent to popular applause, superior to authoritative dicta, devoted to the discovery and revelation of truth, that Knowledge has been promoted, and Society released from the fetters of superstition and the trammels of ignorance, ever since the revival of letters.

The first requisite of success in any institution is a staff of eminent teachers, each of whom gives freely the best of which he is capable. The best varies with the individual; one may be an admirable lecturer or teacher; another a profound

thinker; a third a keen investigator; another a skilful experimenter; the next, a man of great acquisitions; one may excel by his industry, another by his enthusiasm, another by his learning, another by his genius; but every member of a faculty should be distinguished by some uncommon attainments and by some special aptitudes, while the faculty as a whole should be united and coöperative. Each professor, according to his subject and his talents, should have his own best mode of working, adjusted to and controlled by the exigencies of the institution with which he is associated.

It is fortunate for us, that although the number of professors is not large, they are men of very different antecedents, and of very different intellectual qualities, so that each in his way strengthens all the others. It is not without interest to the public, also, that in determining questions of policy and administration, there are those among us who are personally familiar with the methods of institutions quite diverse in character. Among the seven persons who have constituted the nucleus of the Faculty, are graduates of the Universities of Oxford, Cambridge, London, and Göttingen, of American colleges, of a medical school, and of a technological school. These same gentlemen have also been familiar as teachers and examiners with a still greater variety of institutions, and in all

their discussions this diversity of experience proves most advantageous. The staff of Associates, Lecturers and Fellows includes the representatives of a still wider circle of literary institutions.

For an exposition of the views which are held by the professors in the development of their departments, according to the principles now laid down, reference may be made to an address by Professor Sylvester (Feb. 22, 1876) on Mathematical Studies and University Life; to an article by Professor Gildersleeve, entitled "Classics and Colleges," in the *Princeton Review* for July, 1878; to an introductory discourse by Professor Martin on the study of Biology, printed in the *Popular Science Monthly*, for January, 1877; to some remarks on the study of Chemistry, by Professor Remsen, in the *Popular Science Monthly*, for April, 1877, and to a review of the laboratory work here inaugurated, which was presented at the commemoration exercises of 1878, by Professor Remsen, and is printed in part on a subsequent page of this report. There are also numerous reports, circulars and programmes published by the University of which a list is appended.

The second requisite of a university is a corps of well qualified students. The nucleus of such a body was secured from the first by a system of fellowships which brought to Baltimore twenty specialists, already graduated elsewhere, and ready

to continue among us their higher studies, sometimes with reference to a degree and sometimes with reference to professorships, or other literary and scientific careers. The condition on which these fellowships were bestowed was very simple ; but in consequence of the large number of applicants, not only at the time of the original appointment, but whenever vacancies have occurred, the selection has been attended with great difficulty. As a result of the care which the Faculty have exercised in this respect, it may be mentioned that several of the holders of these fellowships have been invited to become instructors in other institutions of acknowledged character, and several have been promoted to the rank of Assistant Professor or Associate among us. Many of the Fellows have proffered courses of instruction or lectures, with the approval of the Faculty : Mr. Means on the Eastern Question, Mr. Royce on German Literature, Mr. H. C. Adams on Political Economy, Mr. Halsted on Modern Logic, Mr. Sihler in Greek, etc. Possibly in the future still greater prominence will be given to such courses, and thus the fellowship system will become a sort of training school for young professors. A list is given in the Appendix of all who have been appointed Fellows.

Around this nucleus of the Fellows were soon gathered other graduates, twenty being enrolled in

the first year, thirty-eight in the second. They bore diplomas from many American colleges, and from several foreign institutions. Among the number were some who had commenced the practice of law or medicine, several clergymen, and several who had held responsible places as teachers. All such students were made welcome, —but in order that no false impression might be given at a distance, those who were enrolled as candidates for the degree of Doctor of Philosophy, or who were giving all their time to study, without reference to a degree, were designated as “Members of the University” and became entitled to some slight distinctive privileges. Twenty such in addition to the twenty Fellows were so designated in the winter of 1877–78.

It is believed that as the plans of this institution become known, many young men who have graduated in colleges, will desire to come to Baltimore for one or more years of graduate study, with or without regard, as the case may be, to the attainment of a second academic degree. In the library, the laboratories, the scientific associations and the lecture rooms, but especially in access to the private instructions and counsels of the professors, such students will find abundant opportunities for continuing their education.

METHODS OF INSTRUCTION.—The methods of instruction have varied with the preference of the

teachers and with the requirements of the subject. In certain branches of mathematics, in chemistry, physics, biology, etc., courses of lectures extending through the entire year have been given; the laboratories have been opened under competent direction six days in the week; in languages and literature a great variety of classes have been formed. The students have not been distributed into seniors, juniors, etc., or into first, second and third year classes; but each one has been assigned to a member of the Faculty who has acted as his official Adviser, and has assisted him in determining the order of his studies,—so that amid the manifold opportunities which are here afforded the scholar may not be bewildered. A careful record of the examinations is preserved and no one will be permitted to prosecute his studies, unless he satisfies the tests of talent and industry established by the Faculty.

The character of the work which has been in progress in the laboratories was set forth in an address by Professor Remsen in the following terms: (Feb. 22, 1878.)

I have been asked to make some statements in regard to the activity of the three scientific laboratories which form a part of our University, and I undertake the task with pleasure. The theme is a more fruitful one than a year ago most of us anticipated. The three laboratories already have records which speak for themselves. I shall endeavor to call attention in as few words as possible, particularly to such original investigations as have either already been completed or are now in progress. It is believed that we can thus get a fairer picture and truer measure of the best form of activity than by any other method.

The work in the biological laboratory has diverged along the two main lines of biological science, the study of structure and development or morphology, and the study of function or physiology. Under the direction of the professor, one student has been engaged for the past twelve months in the study of the structure of the glands of the stomach, with the view of endeavoring to decide what part each of the two kinds of cells lining them plays in the formation of the digestive secretion. With this has been combined a study of the digestive power of the stomach under different conditions and the study of the development of its glands in the embryo.

Another investigation which is going on is one into the changes in the spinal cord which follow cutting of certain nerve roots, with the view of tracing upwards particular fibres in the spinal cord on their course to the brain.

Another very interesting investigation in progress in the laboratory is a study of the life history of certain microscopic fungi which cause some skin diseases. In the skin these occur in only one stage of their life history, but by planting spores, taken from the skin, in different artificial nutrient fluids, it has been possible to follow out at least one previously unknown stage; and by further cultures, under different conditions, it is hoped to follow the whole life history of the plant. The importance of this, with reference to the origin and spread of these diseases does not need pointing out.

A series of investigations on the activity of the nervous factors in the respiratory mechanism of the frog, is also in progress, which, it is hoped, will throw some light upon the nature and mode of action of the respiratory centre in other animals, a physiological question which is, at present, in a very unsatisfactory state. With this matter is, moreover, involved a point of the highest importance in the physiology of the nerve centres: the question, namely, whether some of them can start nervous stimuli without being aroused to activity by some external influence acting upon the body, or whether, in all such cases, the nervous discharge is really excited, though perhaps in a roundabout way, by external changes. In other words, whether some nerve centres are really *automatic*, or whether all apparently automatic actions are not really disguised *reflex actions*.

On the morphological side, one of the Fellows has been employed for the past year in studying the development of the bony fishes, especially the *Salmonidæ*. During the past summer he traced the external changes of form undergone by the developing shad and smelt; and he has just published a series of illustrated papers upon these fishes, in the annual report of the Maryland Fish Commission for 1878. His published papers upon this subject are introductory to the more important and exhaustive results which he expects to reach by the study of his preparations.

Another Fellow is employed in the study of the embryology and adult structure of the Salamander. He has traced the external changes very completely, and has made a great number of sketches, as well as forty careful drawings, showing the external form of the animal at all stages of development. He has also made about six hundred microscopic sections of eggs and embryos, which he is now studying. The method of studying the growth of an animal by making transparent sections of hardened embryos, has been almost entirely neglected by American observers, who have generally been content to rest satisfied with mere superficial examination. The application of this improved method of research to American forms of life may be expected to yield important results.

Finally, a wide research is being carried on by the Associate as to the development of the *Mollusca* in its bearing upon the phylogeny of the group, and upon the Gastrula theory of Hæckel. The developmental history of a number of forms has been traced, and two illustrated papers are now in press, and another in preparation.

In the Physical department the Professor has decided a question of fundamental importance in connection with the theory of electricity. He has proved that, when electricity is carried along through space, magnetic action is produced, and that the amount of magnetic action is the same whether the electricity is carried along through space or conducted in a wire. It is believed that this fact will prove the existence of an electrical fluid.

The Professor has also made a new determination of the value of the absolute unit of electrical resistance. This value, which is of great importance in researches in electricity, had been determined by many others, the result most commonly accepted being that obtained by a committee of the British Association. Modern results differ from one another as much as four per cent. The discrepancies between the many results on record have led the Royal Society of England to appropriate a considerable sum for the purpose of making a new determination. The result obtained here last year differs only eight-tenths of one per cent., from that of the British Association.

Another investigation, the experimental part of which was carried out by a Fellow in the department of Physics, had for its object the determination of the diamagnetic constants of certain substances, but it is difficult to state in an intelligible way to a non-professional audience the object of these experiments.

At present the Professor of Physics is engaged in determining the mechanical equivalent of heat. When some years ago, it was shown that heat is only a peculiar kind of motion, and that ordinary perceptible motion can be converted into heat, and the heat reconverted into perceptible motion, attempts were made to determine exactly how much heat is equivalent to a certain definite amount of work. The work performed in any given case is measured by the weight of the body moved and the distance through which it is moved. Thus, if a body

weighing one pound is lifted through one foot, work equal to one foot-pound is performed. If moved through two feet, or if the body weighs two pounds and is moved through one foot, two foot-pounds of work are performed. So, also, if a body weighing a pound be allowed to fall through one foot, a foot-pound of work will be accomplished. If a body thus falling be suddenly and perfectly stopped the perceptible motion is converted into heat. Now for a certain amount of work which thus disappears a certain quantity of heat makes its appearance.

Joule, in England, first attempted, by direct experiments, to establish the relation between work and heat, and by ingenious methods obtained results which have since been used extensively. Other observers have obtained results differing from those of Joule.

The elaborate experiments which are now going on here, although not yet completed, have already shown that Joule's result, obtained years ago, is probably more accurate than any of those obtained since. The apparatus employed in these experiments was designed and made here. It is very ingenious, and a study of it will show that it is certainly capable of giving results of great accuracy. It is run by a steam engine, and kept going for a length of time continuously, so that a great many results are obtained in every series of observations. The experiments are performed partly under the auspices of the American Academy of Arts and Sciences in Boston.

The Associate in Physics has been engaged in working out a theory of a lens to be used in astronomical telescopes. The chief difficulty in these lenses at present is the color produced by them called the secondary spectrum. By using three kinds of glass, and combining them according to the principles of a definite theory, this great difficulty can be overcome. A telescope is to be constructed involving the use of the new object-glass.

In the Chemical Laboratory, work has been going on only since February, 1877, and the building was not completed until the beginning of the present academic year. I shall endeavor to give you a faint idea of the tendency of the higher work which has been done. A large number of the compounds of carbon are classed collectively under the head "Aromatic Bodies." They possess marked peculiarities which distinguish them clearly from other compounds. They present many interesting phenomena which have attracted the attention of a large number of chemists, particularly during the past ten or a dozen years. One peculiar fact in regard to them is this, that they yield three well characterized series of derivatives of precisely the same composition. A theory has been proposed to account for this fact, and the theory has been pretty generally accepted.

Two of the Fellows, together with the Associate in Chemistry, have been engaged during the past year in studying with me some members of these three series for the purpose, if possible, of establishing fundamental differences in properties between them. Up to the present other

investigators have determined to which series an unknown compound belonged solely by converting it into a known compound. The effort has been made in some of the investigations which are in progress in the chemical laboratory to determine the series of a compound by studying the substance itself in such a way as to reveal properties characteristic of the members of one or the other series. In other words, we are working entirely independently of the theory. Certain results have already been reached which promise a definite solution of the problem before us. Some of these results have been published in brief in this country under the head of "Notes from the Chemical Laboratory," and in the journal of the German Chemical Society. It appears from a notice in the last number of this journal that some of the conclusions reached by us by our method of inquiry do not harmonize with conclusions drawn by the usual method; and it is believed that the efforts necessary to show the cause of the discrepancy must lead to a clearer conception of the questions under discussion than we have at present.

Another investigation by a Fellow has an object akin to that of the more extended one just referred to. In this case, also, definite results have been reached; and these will form the subject of a dissertation to be presented to the Faculty of this University by the gentleman, through whose labors they have been accomplished, as a candidate for the degree of Doctor of Philosophy.

Further, a student has been engaged independently in perfecting a simplified and convenient method for the analysis of gases. He has devised a complex form of apparatus, which promises to be of value.

These statements will serve to give you some idea of the character of the higher work going on within our walls, at least in the three scientific laboratories. Those statements which have been made concerning the work in other departments will indicate that activity is not displayed in but one direction. I do not think there is any evidence in this institution to develop in one direction in such a way as to check development in other directions; and I shall be sorry if the day ever comes when it can be said that here science is fostered and other subjects neglected, or that other subjects are specially fostered and the sciences neglected. I know there is no desire on the part of our authorities to encourage any one subject or set of subjects in such a way as to interfere with others. The antagonism which here and there exists between the so-called classical and scientific training does not exist among us. But an error which is too frequently fallen into is here avoided. Students are not admitted to a course of scientific studies on easier terms than those who desire a classical course, and, after being admitted, as much is required of one class as of the other. If these principles are strictly adhered to—and there is no reason to believe that they will not be—there will be less cause for the now somewhat justified belief that the scientific student is not as well trained as the graduate of the college proper. The right of this method of dealing with the matter is so apparent as to require no justification.

An important element in our intellectual activity has been the opportunity of frequent and informal meetings in which professors and scholars have taken part. During the first year, social gatherings (attended by trustees, professors, instructors and advanced scholars) were held monthly in Hopkins Hall and the Library. At each of these gatherings some subject was brought forward and treated in a way to interest all who were present,—for example, the excavations at Olympia, by an eye witness; the Bayreuth festival, by an auditor; the U. S. Fish Commission, by a collaborator; the Biological Laboratory, by the Biologists; the Peabody Institute, by the Provost, etc. These informal assemblies tended to promote a friendly acquaintance among those who were brought together for the first time from distant places; but in the second year, there was a call for more special gatherings,—having a scientific, rather than an entertaining character.

Accordingly four associations have been organized :

1. A General Scientific Association.
2. A Philological Association.
3. An Historical Association.
4. A Mathematical Conference.

These associations are attended by the Professors, Associates, Fellows and Graduate Students in the several departments.

In forming plans, we have constantly remembered, as already stated, that it has been important to provide for the youth of Baltimore, (and for such others as might desire the same advantages), ordinary college instruction intermediate between the City College and the private school on the one hand, and the university courses on the other. We have been fortunate in securing for the college part of our work, gentlemen who are acknowledged to be of uncommon ability as classical and mathematical teachers, and we can now truly say that the youth of Baltimore have opened to them a well considered system of instruction from the primary school to the university, so that it is not necessary for them to go to a distance from their homes in order to obtain a liberal and thorough education either in science or literature.

There are some peculiar arrangements in our college work which are regarded as advantageous. The large number of teachers in proportion to the scholars gives to the latter the advantage of close personal observation and guidance. The abandonment of the traditional class system, enables those who are favored by the possession of uncommon talent, or health, or early advantages, to push forward in their studies as rapidly as they choose; and it enables those whose early training has not been so good, or whose health gives out, or who need to spend a part of their time in the acqui-

sition of a support, to prolong their course over a longer period than is usual. The permission of eclectic courses enables us to give simultaneously, to different sets of pupils, the traditional college training in classical studies or the fundamental studies of the modern scientific schools. At the same time there is no marked subdivision between those who follow the old paths and those who choose the new. The same standard of matriculation is established, the same firmness and persistence of application are expected, the same severity of examinations is maintained for all sorts of students, and care will be taken that every one who receives the Baccalaureate degree shall be liberally trained in language, mathematics and some branch of science, the proportions of different studies being left to the choice of the student under the regulations of the Faculty.

Seven combinations of collegiate study are suggested in the Programme, either of which will lead to a Baccalaureate degree. These courses are as follows :

- (1.) *For one who wishes a good Classical training :*
Marked proficiency in Greek and Latin.
in addition—Modern Languages, Philosophy, and any one scientific subject.
- (2.) *For one who looks towards a course in Medicine :*
Marked proficiency in Biology, and either Chemistry or Physics.
in addition—Either Chemistry or Physics, Modern Languages and Philosophy.

- (8.) *For one who prefers Mathematical studies, with reference to Engineering, Astronomy, Teaching, &c.:*
Marked proficiency in Mathematics and Physics.
in addition—Modern Languages, Philosophy and Chemistry.
- (4.) *For one who wishes an education in Scientific studies, not having chosen his specialty:*
Marked proficiency in Mathematics, and one of the following subjects:
Chemistry, Physics, or Biology.
in addition—Modern Languages, Philosophy, etc.
- (5.) *For one who expects to pursue a course in Theology:*
Marked proficiency in Greek and Hebrew
in addition—Philosophy, and two scientific subjects.
- (6.) *For one who proposes to study Law:*
 The same as No. 1, with the substitution of Philosophy and History for Greek, and two (instead of one) scientific subjects.
- (7.) *For one who wishes a Literary training not rigidly Classical:*
Marked proficiency in Modern Languages and Philosophy.
in addition—Latin, and two other subjects.

It may perhaps be of service to give, by one or two concrete instances, illustrations of the way in which this system of collegiate instruction actually works.

A. B. came to this University in January, 1877. He was backward in Latin, and only a beginner in Greek. But as it was apparent that he was a person of intelligence and earnestness he was admitted as a candidate for matriculation. He was allowed to join classes which were in attainment considerably in advance of himself; but he soon made himself at least the equal of his associates in recitation; and passed examinations in June, 1877, so satisfactorily that he was then entered in the register of matriculates.

It then became his duty, with the counsel of his adviser, to select a course of study, the satisfactory completion of which would entitle him to the Baccalaureate degree. He chose Latin and Greek as his major subjects; and for his minor subjects, History, Modern Languages and Biology.

In Greek he selected: Homer *Il.*, I-XII; Euripides, three plays; Aristophanes, three plays; Demosthenes, the *de Corona* and two other speeches; Plato, Protagoras; and Thucydides, lib. I-IV.

In Latin he selected: Virgil, *Georgics* and *Æneid*, IV-IX; Plautus, one play; Terence, one play; Tacitus, *Annals*, I-VI; Cicero, select letters and three speeches; Horace, *Odes*, *Epodes* and *Satires*.

In making such a selection of particular books it is always understood that substitutions may be made subsequently, if any reason for it is alleged satisfactory to the student's adviser.

During the year just passed this student has passed an excellent examination, as certified, in every case but one, by an independent examiner in addition to the class instructor, in *Euripides*, Iph. Taur ; *Aristophanes*, Nubes ; *Demosthenes*, in Phorm. and in Call. ; *Plato*, Protagoras ; *Plautus*, Captivi ; *Terence*, Phormio ; *Cicero*, pro Cluentio, and select Letters. He has besides completed his minor course in History. In this case all of the Latin and Greek were read in class with an instructor.

Another instance of a somewhat different character may be mentioned.

C. D. entered the University in October, 1877 with an excellent preparation. It is not necessary to mention the scheme of studies he selected ; but during the year he has disposed satisfactorily, in all cases, with the double examination spoken of above, of the following parts of his work :

Tacitus, Hist. I ; *Plato*, Apology and Crito ; *Thucydides*, lib. I ; *Horace*, Satires and Ars Poetica ; *Plato*, Protagoras. These books were read in class with an instructor. Besides this he offered the following books as the object of his private study, and passed in them satisfactorily under similar tests : *Horace*, Odes and Epodes ; *Tacitus*, Hist. II-V, with Germ. and Agric. ; and also finished the minor course in French and German.

In classical studies, care is taken by the instructors to vary from year to year the authors and books they select as the basis of their recitations so that a student who passes two or three years here will have the advantage of class-instruction in a considerable range of writings. But, as may be seen in the second of the cases above described, a student may extend his reading beyond and outside the work of the class-room, and may avail himself of whatever advantages he possesses, either of previous training, or health, or aptitude for study, to press on rapidly in the fulfilment of the work antecedent to his degree ; as he knows that the University will give him credit for this private

work, no less than for that done under the eye of instructors, if it satisfies the exactions of the examiners in regard to breadth and accuracy.

The standard of matriculation has been purposely made higher than is usual, for the sake of encouraging young men who may propose coming to Baltimore to secure in advance, near to their own homes, as good a preparation as they can in fundamental studies. The plans of St. Johns College, in Annapolis, are now so arranged that young men at the close of the sophomore year may pass our matriculation examination. The addition of a fifth year to the course of the City College is likely to be of great advantage to the large numbers of young men who look to it for their early intellectual training, antecedent to university life.

PUBLIC AFTERNOON LECTURES.—A part of the University lectures have been open to the educated citizens of Baltimore, under simple regulations, since the beginning of the University. Some of these courses have been given by the resident professors, associates and fellows; but most have been delivered by gentlemen from a distance who are acknowledged authorities as teachers or investigators in the subjects they have treated.

The audience on these occasions has varied in numbers from an average of a dozen hearers in a course of twenty lectures, to an average of two

hundred in a course of the same length; but the number of attendants gives no indication of the value of the course. Some of the subjects discussed, particularly literary themes, are interesting to many persons, while others having a decidedly technical or professional character, are only attractive to special students. Indeed, the direct effort has been made to secure such lecturers and to introduce such themes as would interest different classes of hearers. A scrutiny of the registered names of attendants shows that among them there have always been (1) the members of the University interested in the subject presented, (2) teachers from the public and private schools, (3) professional students,—of law, medicine, chemistry, etc., and (4) other educated persons, ladies and gentlemen, who came from various motives.

The University has derived much advantage from the maintenance of these lectures. Subjects not treated by the resident professors, have been discussed, in a masterly way, by some of the most eminent scholars in this country. Three of the courses have already formed the basis of printed volumes; on Astronomy by Professor Newcomb, on Money by Professor Walker, and on Torts by Professor Cooley. It was once suggested that the publication of the lectures should be required; but the proposition was never formally adopted. These non-resident lecturers during their stay in Balti-

more have given private guidance and instruction to those who have sought it from them,—in some cases organizing small classes for conference and discussion on special themes.

As an illustration of the work of these conferences, the following statement is given:

The class in Constitutional Law met twice a week during the stay of Judge Cooley in Baltimore. There were ten persons connected with the class, some of whom were Fellows of the Johns Hopkins University and others, young lawyers from the city. The special subject of inquiry and discussion was the theory of the American constitution. This subject had been suggested by some of the Fellows who had already studied historically the formation of our system of government and who were therefore desirous of supplementing their course by obtaining some instruction in the principles of American constitutional law. Judge Cooley kindly consented to give us his views concerning the theory of the constitution, but disclaimed any adherence to partisan schools of interpretation. He conducted the class in an informal way, he himself reading and expounding the most important articles of the constitution, but encouraging discussion and eliciting the views of the class by the method of question and answer. Decisions by the Supreme Court, which served to determine the extent of congressional powers as distinguished from the powers retained by the States, were often cited by Judge Cooley and the cases themselves were usually explained. So far as practicable, moreover, a comparison was instituted between the principles of our government and those of the English system. The constitutional problems of our own day were also freely discussed.

The entire course closely resembled the methods of instruction which are pursued in the so called *Seminarien* at the German Universities. The professor guides and instructs the class in a familiar way; topics are discussed informally; students ask questions of the professor and the latter expounds; the professor asks questions of the students and views are compared. In Heidelberg, Dr. Bluntschli used to take the Prussian constitution as the basis of discussion in his private class of eight or ten men. He would first compare each article with its prototype in the Belgian constitution and then proceed to a comparative view of similar features of public law as seen in France, England, and the United States.

Much interest was manifested by Judge Cooley's class in the comparative method of studying the American and English systems of government, and it is generally hoped that this subject may be resumed.

The Lecturers, as they have been called upon, have also favored the University with their counsel and suggestions in respect to the development of our plans, and in many other ways have quickened the intellectual life of this community. But, perhaps, the greatest advantage of all has been the interest thus awakened here among cultivated persons, in this new foundation. By no other method could the attention and approbation of our own citizens be so quickly secured as by inviting them to our halls and encouraging them to become acquainted with the methods and principles on which we rely. A city of 300,000 inhabitants is quite large enough by itself to send up every year to the University, full classes of bright and aspiring young men, and they are most likely to be incited to an intellectual life by the glimpses they get of it, and the reports they hear from it, as month by month, one great subject after another, is publicly expounded by some learned lecturer.

It is quite possible that as the resident staff of the University increases in numbers, there will be less reason than there has been for the engagement of gentlemen from other colleges; and there are indications that the Peabody Institute will resume its class instruction on such a plan,—perhaps with the coöperation of the University,—as to relieve us from this part of our work; but such questions as these do not require immediate decision.

Every encouragement has been given to the teachers of the University to publish freely. A list of the various books and papers printed by the resident members of the University during the last two years, under their own names, includes over one hundred titles; among them are many important communications to the scientific journals of this country and of Europe.

Under the auspices of the University, the "American Journal of Mathematics, Pure and Applied," has been instituted by Professor Sylvester, with the coöperation of Dr. Story and Professor Rowland of Baltimore, Professor Peirce of Harvard and Professor Newcomb of Washington. The Journal appears in large quarto form, whenever sufficient material is presented.

The researches made in the Chemical Laboratory under the direction of Professor Remsen, and his associate Dr. Morse, are published in occasional bulletins. Three numbers, including 68 octavo pages have already appeared.

Communications from the Biological Laboratory have been sent to the Journal of Physiology, published in Cambridge, England, under the editorial care of Professor Michael Foster; Dr. Martin being one of the associate editors.

Philological papers have been submitted to the American Philological Association, and to the American Oriental Society, by Professor Gildersleeve, Dr. Lanman, and others.

RELATIONS WITH OTHER INSTITUTIONS.—As the youngest of many organizations already in progress, the Johns Hopkins University may naturally hesitate to be forward in the proffer of coöperation with others, but it ought never to be backward in meeting with open and outstretched hand all overtures from its elders. The schools of law and medicine, maintained in Baltimore for many years past, (and never, perhaps, with more efficiency than now,) are so well attended as to make it quite superfluous for us to offer what they already provide. The City College is one of our chief allies among the preparatory schools, and has sent us many of our very best scholars. The Academy of Sciences is building up a Museum of Natural History, especially of the fauna and flora of Maryland, and ought to be so liberally endowed as to become the Museum of the city and the University. In the well furnished library of the Maryland Historical Society, the advanced students in American history have had rare facilities for their researches most generously bestowed. The Mercantile Library, in its way, has also been freely accessible,—and with other local organizations our relations have been of the most friendly sort. The Athenæum has extended to us social courtesies in a liberal spirit. The newspaper Press in Baltimore has also been of great service in freely communicating to the public the announcements of the

University, and the reports of its public celebrations and addresses.

But there is one foundation, the Peabody Institute, upon which we depend, one may almost say, for intellectual sustenance. Its large and well chosen library, its important series of scientific journals and transactions, purchased with reference to the wants of scholars, and its funds for the constant increase of these collections, relieve the University from the necessity of establishing a general library upon a liberal scale. In a previous report, the letters exchanged by the Peabody and Hopkins Trustees have been printed, and during the past year there have been repeated conferences between the authorities of both foundations looking toward their mutual coöperation in the advancement of learning, especially in respect to the use of the library and the maintenance of class lectures. The recent completion of a large addition to the Peabody building to which the Library and Reading-room are transferred, and in which two new lecture-rooms are provided, has led to the hope that greater facilities than have hitherto been possible will now be given to scholars in the use of the library. The proposal has also been made that from time to time courses of public lectures shall be delivered by the teachers of the University before such classes as may be formed by the Peabody Institute. Incidental advantages also come

to the University from the Peabody departments of Music and the Fine Arts. There is every reason to rejoice that these foundations can be made so coöperative in promoting the good of the community. Each adds to the other's efficiency.

If Mr. Peabody had known that his example would be followed by Mr. Hopkins, or if the latter had purposed to render the foundation of the former most complete, their wishes could hardly be better expressed than they are, in order that each corporation may have its distinct sphere, its special guardians and managers, and its own independent responsibilities, and yet may be helpful to and aided by the work of the other. This union so far as the Library is concerned, is an affair of the heart itself,—for here the two institutions must inevitably unite or divide, be supporters or rivals. The life of a university depends upon books. There is no such thing as a strong university apart from a great library. Nor is it enough that books shall be collected and stored away for the generations to come. They must be readily accessible to those who can use them. It is a cause of constant congratulation to the teachers of the University, that the authorities of the Peabody Institute have built up so good a library, and that now by means of the new arrangements, there is reason to anticipate facilities in the consultation of books quite as free as are accorded in corres-

ponding libraries at home and abroad. If this hope is realized the power of the University will be greatly augmented and the obligations of scholars resident in Baltimore will be due in an almost equal degree to Peabody and Hopkins.

INSTRUCTION TO TEACHERS IN PHYSIOLOGY.—Influenced by a desire to awaken among School Teachers an interest in the study of Nature, and to give to them an opportunity for seeing something of the methods of modern scientific researches, Professor Martin offered to form in the Autumn of 1877, a Teacher's Class for Instruction in Physiology. It was strictly limited to school teachers or students of a normal college, who were engaged in teaching Physiology, or who purposed to teach it. Only sixteen students were received.

The class met for twenty weeks in Hopkins Hall on Saturday mornings at 10 A. M., commencing on Saturday, October 13. After a lecture the students adjourned to the Biological Laboratory for practical instruction, which continued until 2 P. M. It was announced that absence from any lesson, unless for a cause which the authorities of the University might deem satisfactory, would be treated as a resignation and the absentee's place filled up forthwith.

Microscopes and other instruments and the necessary material were provided by the University.

A statement of the results of this experiment is given in the following letter of Dr. Martin:

MARCH 18th, 1878.

To the President of the Johns Hopkins University.

DEAR SIR: The class for the Instruction in Physiology of School Teachers finished its prescribed course of twenty lessons on Saturday last. It started with sixteen students, and experience of the first lesson or two having shown that a greater number could not be satisfactorily accommodated, subsequent applications for admission, which would have filled up the class to the number of eighteen, originally contemplated, were refused. Of the sixteen students, one left Baltimore at Christmas; all the rest remained with the class until the end of the course. The names of the class are as follows:

Miss Cowman,	Miss Bailey,	G. L. Smith,
Miss Pusey,	Miss Blackburn,	E. G. Gover,
Miss Richmond,	Miss Yarnall,	S. T. Moreland,
Miss Smyth,	Miss Nunn,	J. L. Tomlinson,
Miss Hampson,	Miss Bauman,	W. J. Cross.
Miss Warner,		

The strict rule enforcing attendance under the penalty of the removal of the absentee's name from the list of members of the class, worked very well, and I think caused no dissatisfaction. As the labor of getting the material ready for each Saturday's work was always considerable and often very great, all must have recognized it as fair that places should not be held by those who remained away for trivial causes. I am not sure, however, that I am not doing the members of the class an injustice in supposing that any such rule was necessary; several times I have been informed that some of the students had got up from a sick bed to attend the class, and have returned to it immediately afterwards; and one student, for several weeks, came regularly from Philadelphia every Saturday morning simply in order not to miss the lesson. Only six cases of absence occurred throughout, and all were satisfactorily accounted for.

The way in which the students worked was very gratifying to me. Almost without exception, they took a thorough interest in what they had to do, and in that way lightened my task to an extent for which I cannot but feel grateful to them. It is not too much to say that a spirit of earnestness characterized the class, and a desire to facilitate the work of Mr. Sewall and myself.

Some few students had, however, less knowledge of Physiology than was desirable in order to fully benefit by the Course; which, as stated in the preliminary announcement, was designed for those teaching, or pre-

paring to teach Physiology, and who might, therefore, be expected to have a fair elementary acquaintance with it, at least so far as book knowledge was concerned. In the case of similar classes being formed in the future, it would, I think, be desirable to try to select only those who already know something of the subject to be taught. The object of such courses is not to teach beginners, but to give good teachers an opportunity of acquiring a practical knowledge of their subject, which it might be otherwise difficult for them to obtain, and to put them in the way of demonstrating various simple facts to their pupils.

You will remember, that at my request, the Trustees offered to present a microscope to the student whose work in the Laboratory and whose notes on that work were the best. This was desirable on the first organization of such a course as a stimulus, until the students had got used to the method of teaching adopted, had learnt the value of making drawings of the objects which they saw and of other details insisted upon, which at first were probably irksome and appeared useless to many. Whether it would be desirable again to offer a similar prize is, I think, doubtful. If this class has been really successful and has been found valuable by those attending it, which the future must shew, applicants to join a similar class hereafter should require no such incentive, which except under exceptional circumstances is, I think, bad in principle, for teachers ought to require no extra inducement to make use of an opportunity to learn.

To arrive at a decision as to who was entitled to this microscope has given me some trouble, for the work of about half a dozen members of the class was very nearly equally excellent. On the whole I believe the best work was done by Mr. S. T. Moreland, but that of Miss E. Cowman was very nearly as good.

I beg leave therefore to recommend that the microscope (which I purchased for this purpose in London during the summer) be presented to Mr. S. T. Moreland.

Yours very truly,

H. NEWELL MARTIN.

Another kindred experiment was made in the long vacation of 1878, by Dr. W. K. Brooks, Assistant Professor of Comparative Anatomy, who organized a company of scientific students for the study of marine zoölogy at the mouth of the Chesapeake Bay. An account of this undertaking is given in the Appendix.

EXAMINATIONS AND DEGREES.—From what has now been said it must be obvious that the authorities of the University are endeavoring to extend the advantages of the foundation as widely as possible; while the honors are bestowed with caution and discrimination. Thus far there has not been time for the collegiate course to be completed by any candidate. The matriculation is difficult, and the examinations for degrees are thorough and impartial. Classes in the ancient and modern languages have been tested by two examiners, one of whom was the class instructor, the other was not; and the standing of each scholar was determined by a combination of the grades given by the two examiners.

The following tables may be taken as illustrating the actual working of this system. The first column after the initial letters gives the marks assigned by the Teacher of the Class as the result of an examination conducted by himself, with a word characterizing the performance of each student. The second column contains corresponding marks and words assigned by an independent examiner as the result of a separate examination on the same book. The third column indicates those students whom the faculty, in view of both the preceding series of marks, decided to have passed in these books.

EXAM. IN PLAUT. CAPT. AND TER. PHORM.				EXAM. IN GERMAN, (SCHIL- LER AND GOETHE.)			
	Instructor.	Univ. Ex.			Instructor.	Univ. Ex.	
A	78—ex.	88—ex.	P.	A	90—ex.	87—good.	P.
B	82—ex.	93—ex.	P.	B	70—poor.	76—	
C	92—ex.	77—poor.	P.	C	86—good.	79—good.	P.
D	98—ex.	85—good.	P.	D	87—good.	88—good.	P.
E	76—good.	80—	P.	E	73—poor.	68—pass.	
F*	86—good.	75—poor.		F	82—pass.	67—pass.	P.
G	92—ex.	94—ex.	P.	G	79—pass.	77—good.	P.
H	93—ex.	94—ex.	P.	H	69—poor.	25—poor.	
I	60—pass.	75—poor.		I	91—ex	79—good.	P.

* Only a small part of the paper was done, but this was satisfactory.

Four of the holders of Fellowships were admitted, on the 13th of June, 1878, to the degree of Doctor of Philosophy. The principles upon which this degree was conferred have been stated as follows:

The Degree of A. M. and Ph. D.—The candidates must already have been admitted, two years or more previously, to the first or Baccalaureate degree in a respectable institution of recognized authority. Where a diploma for some exceptional reason has not been conferred, the Faculty reserves the right to accept other evidences of liberal preparation for higher work. The value of thorough preliminary training, before beginning a course of higher studies, is beyond estimate. University work requires as a foundation not merely accurate and varied knowledge, but those orderly habits of mind, those systematic methods of inquiry, and those powers of clear and fitting expression which are best promoted by a superior collegiate course.

Each candidate devotes his attention to one main subject and to one subsidiary subject. It is required that these subjects shall be sufficiently broad to require prolonged and arduous study, and that the secondary subject shall be pertinent to the principal theme.

A residence of not less than one year in this University is now required of all candidates for this degree. Many inquiries have been made as to whether candidates not connected with this institution might come up at stated times and be examined for the diploma, without receiving here systematic instruction. The scheme of the University of London is often

suggested as a desirable plan for introduction among us; but before arriving at a conclusion, the authorities have preferred to mature their plans for the promotion of resident students only.

The examination for this degree is threefold. In every case the candidate presents an elaborate thesis, on a topic approved by his chief adviser in the Faculty. The preparation of this thesis requires labor for the greater part of an academic year, and the completed paper is supposed to show the candidate's mastery of his subject, his powers of independent thought as well as of careful research, and his ability to express, in a clear and systematic order, and in appropriate language, the results of his study.

Every thesis is submitted by the Faculty to one of their own number, or to some other competent examiner who certifies whether or not, in his opinion, it is sufficiently good to be accepted. In case of its approval, the personal examination of the candidate goes forward, and this varies in form at the convenience of the examiner and in accordance with the requirements of the subject. As a part of the examination, the candidate appears before the professors collectively, or before some of their number, and submits to an oral questioning; at another time prepared questions are set before him for careful answers in writing.

An acquaintance with Latin, French and German, so far at least that writings in these languages may be easily read, is in all cases expected.

Evidence of acquaintance with the methods of modern scientific research, in at least one branch of science, is also expected in the case of those whose principal studies are in such departments as language, history, philosophy, etc.

In subjects admitting of exercises with instruments or of the scrutiny of specimens, the examiners are free to appoint special methods for determining the skill of the candidates.

In addition to the resident professors, scholars of distinction are from time to time invited to participate in the examinations, and examine the theses of the candidates. The object of this provision is to secure an estimate of the work of the candidates from those who are not responsible for their daily progress.

The following statement gives the names of the graduates of 1878, and the methods of their examination:

1. HENRY C. ADAMS, of Iowa, a Bachelor and a Master of Arts in Iowa College, presented a thesis on the "*History of Taxation in the United States*," which was examined by Professor Walker of Yale College. The candidate's principal examination was in Political Economy, and was conducted in the presence of the Faculty, by Prof. Walker. The subsidiary examination was in American History. The questions in this

subject, which were answered in writing, were proposed by Mr. George Bancroft of Washington; the oral examination was conducted by Dr. Scott.

2. THOMAS CRAIG, of Pennsylvania, who had received the degree of Civil Engineer from Lafayette College, presented a thesis on "*The Representation of one Surface upon another; and on some points in the Theory of the Curvature of Surfaces*." His examination in Mathematics, his main subject, was upon papers prepared by Professor Sylvester, Professor Newcomb and Dr. Story. His examination in Physics was conducted by Professor Rowland, in the presence of Professor Mallet, of the University of Virginia, and the resident Professors.

3. JOSIAH ROYCE, of California, a Bachelor of Arts of the University of California, presented a thesis on the "*Interdependence of the Principles of Human Knowledge*," which was referred to President Porter of Yale College.

His main subject was the History of Philosophy, ancient and modern, upon which he was examined by Professor G. S. Morris, of the University of Michigan, by written questions. His subsidiary examination was on the history of German literature of the eighteenth and nineteenth centuries, which was conducted by Assistant Professor Brandt, partly in the presence of the Faculty.

4. ERNEST G. SIHLER, of Indiana, who completed the classical course of a German gymnasium, the Concordia College in Indiana, presented a thesis on "*Plato's use of Metaphor and Comparison*," which was referred to Professor Gildersleeve.

The chief examination of the candidate was in Greek History and Literature, and was conducted by Professor Gildersleeve and Professor C. D. Morris. The secondary examination was in Ancient Philosophy, and was conducted orally by Professor G. S. Morris, of the University of Michigan, in the presence of the Faculty. ✓

COMMEMORATION DAY.—The twenty-second of February, commonly observed as a legal holiday in honor of Washington's birth-day, has been adopted by the University as its Commemoration Day. In 1876, the work of the University was formally inaugurated. In 1877, addresses were delivered by the Professor of Mathematics, Mr. Sylvester, and the Professor of Greek, Mr. Gildersleeve, and a poem was read by Professor James

Russell Lowell. In 1878, addresses were made by the Professor of Chemistry, Dr. Remsen, by one of the Trustees, Hon. G. W. Brown, and by President Eliot of Harvard University. These addresses with the remarks of the President of the University were printed with more or less completeness in the newspapers of the day.

THE LIBRARY.—From the report of the Librarian, Mr. Arthur W. Tyler, June 1st, 1878, it appeared that there were 6,167 bound volumes on the shelves of the Library, besides several hundred unbound volumes, and pamphlets. The Library receives by subscription one hundred and sixty-six periodicals and by gift twenty-six.

Through the medium of the new-book department, under the voluntary direction of Mr. T. C. Murray, a large number of recent publications, European and American, have been brought to the University for examination, part of which have been retained by the University and part returned to the senders.

The Library has received many valuable gifts, a list of which is given in the Appendix. Among other noteworthy gifts not before acknowledged, should be mentioned a collection of twelve photographs, mounted and framed, representing the scenery of the Baltimore and Ohio Railroad, presented by John W. Garrett, Esq., one of the Trustees; an autograph of George Washington,

being his original plot of lands at the mouth of the Ohio and Kanhawa rivers, surveyed and offered for sale by him in 1773,—the gift of Reverdy Johnson, Esq.; lithographic portraits of Schelling and Schlosser, from the same donor; and a large photographic likeness of JOHNS HOPKINS, the founder of the University,—presented by Francis White, Esq., the Treasurer of the University.

PERSONAL.—Death has removed from the Board, one of the members originally designated by the Founder to act as a Trustee,—Mr. Thomas M. Smith, who died in Baltimore in August, 1877.

The following minute, adopted by the Board, expresses their appreciation of his character.

The Trustees of the Johns Hopkins University express their sincere respect for the memory of THOMAS M. SMITH, their late associate, who died on the 14th day of last August.

Mr. Smith was the life-long friend of the Founder of the University, and was well known and highly esteemed in this community as a good and patriotic citizen and as a successful merchant, distinguished for good judgment and probity.

Although his failing health prevented his taking a prominent part in the affairs of the University, he performed the duties of a Trustee with broad and liberal views, and with conscientious fidelity.

The place thus made vacant was filled January 7th, 1878, by the election of Mr. Charles Morton Stewart.

The staff of Professors has not been increased within the past year. Nine of the Associates have been designated Assistant Professors,—namely, Messrs. Brandt, Brooks, Cross, Elliott, Hastings,

Morse, Murray, Lanman, and Story; and one of the Fellows, Herbert B. Adams, Ph. D. (Heidelberg) a graduate of Amherst College in 1872, has been made an Associate in History.

Thirty-five persons have held the appointment of Fellow, and those who have given up the post have gone forward, here or elsewhere, to stations of usefulness and honor. Several have received appointments in other colleges.

The number of Students, including the Fellows, entered here during the first two years is 159. On the register of the first year, 89 names were enrolled; of the second year, 104 names.

Summary.

	Fellows.	Other Graduates.	Matriculates.	Special.	Total.
1876-7, . . .	20	84	12	28	89
1877-8, . . .	20	88	24	22	104
1878-9,* . .	20	85	25	85	115

This summary does not include the attendants upon the Physiological class, the Zoological Station and the afternoon courses of lectures publicly given in Hopkins Hall.

Sixteen persons were taught in the Teacher's class in Physiology, during the winter of 1877-8. Ten students worked in the Chesapeake Zoölogical Laboratory in the summer of 1878. The average attendance upon the Philological Association was 13; on the Historical Association 20; on the Scientific Association 25.

*At the opening of the third year. Several of the Students now enrolled as "Special" will soon be matriculates.

The average attendance upon the public afternoon lectures varied in the different courses from 20 to 195, as will be seen from the following statement:

Professor.	Subject.	No. of Lectures.	Average Attendance.
1876-77.			
GILDERSLEEVE, .	Greek Lyric Poetry,	20, .	42
RABILLON, . .	French Literature,	19, .	20
NEWCOMB, . .	History of Astronomy, . . .	20, .	50
CHILD,	Chaucer,	20, .	191
LOWELL, . . .	Dante,	20, .	179
WHITNEY, . . .	Comparative Philology, . . .	18, .	84
HILGARD, . . .	Geodetic Surveys,	20, .	21
WALKER, . . .	Money,	20, .	49
COOLEY, . . .	Torts,	20, .	87
MALLET, . . .	Waste Chemical Products, . .	20, .	29
1877-78.			
REMSEN, . . .	History of Chemistry,	12, .	111
BILLINGS, . . .	Medical Education,	20, .	49
GILDERSLEEVE, .	Homer's Odyssey,	20, .	153
RABILLON, . . .	French Literature,	20, .	48
MORRIS, . . .	History of Philosophy,	20, .	124
CHILD,	Comparative Ballads,	20, .	187
"	Shakspeare,	10, .	195
COOLEY, . . .	Constitutional Law,	6, .	108
JAMES,	Psychology,	10, .	62
ALLEN,	History of Fourteenth Century, .	20, .	96
WALKER, . . .	Finance,	21, .	44
MALLET, . . .	History of Chemical Industry, .	20, .	45

CONCLUSION.—In concluding this report, I beg leave to congratulate the Trustees on the harmony which has attended all the counsels of the University during the critical period of organization. The plans here formed have been adapted to the wants of varied classes, and have been accepted by the public as wise and promising. The excel-

lence of the instruction here given has attracted scholars of mark from distant parts of the country, and has awakened among the youth of Baltimore a determination to profit by such advantages. It is a pleasure to add that not a single case of discipline has yet been brought before the Faculty. When a student has been found to be unable or unwilling to pursue his studies with success, he has quietly been advised to withdraw.

A voluntary religious service has been daily maintained since the opening of the University, with an increasing attendance both of teachers and scholars. The plan of assigning every student to an Adviser, who acts as his friendly counsellor, works well and gives to parents and scholars the assurance that every member of the University will have that personal guidance and help which he needs during his student life.

We have every reason to hope that, with the blessings of Providence, a strong University will, at no distant day, be developed from the germ now planted.

Respectfully submitted,

D. C. GILMAN.

BALTIMORE, *Sept. 1, 1878.*

APPENDIX.

A.

Academic Staff.

PRESIDENT.

Appointed.
Dec. 30, 1874. GILMAN, DANIEL C.

PROFESSORS.

Jan. 3, 1876.	GILDERSLEEVE, BASIL L.,	. . .	<i>Greek.</i>
Mar. 5, 1876.	SYLVESTER, J. J.,	. . .	<i>Mathematics.</i>
Apl. 17, 1876.	REMSSEN, IRA,	. . .	<i>Chemistry.</i>
Apl. 17, 1876.	ROWLAND, HENRY A.,	. . .	<i>Physics.</i>
Sept. 4, 1876.	MARTIN, H. NEWELL,	. . .	<i>Biology.</i>
Sept. 4, 1876.	MORRIS, CHARLES D.,	. . .	<i>Classics.</i>

ASSOCIATES.

April 3, 1876.	CROSS, JOHN M.,	. . .	<i>Classics.</i>
April 3, 1876.	UHLER, PHILIP R.,	. . .	<i>Natural History.</i>
April 17, 1876.	SCOTT, AUSTIN,	. . .	<i>History.</i>
June 5, 1876.	ELLIOTT, A. MARSHALL,	. . .	<i>Modern Philology.</i>
June 5, 1876.	MURRAY, THOMAS C.,	. . .	<i>Shemitic.</i>
Sept. 4, 1876.	BRANDT, HERMAN C. G.,	. . .	<i>German.</i>
Sept. 4, 1876.	BROOKS, WILLIAM K.,	. . .	<i>Biology.</i>
Sept. 4, 1876.	MORSE, HARMON N.,	. . .	<i>Chemistry.</i>
Sept. 4, 1876.	RIDGWAY, ROBERT,	. . .	<i>Natural History.</i> 1877.
Sept. 4, 1876.	STORY, WILLIAM E.,	. . .	<i>Mathematics.</i>
Sept. 4, 1876.	TYLER, ARTHUR W.,	. . .	<i>Library.</i> 1878.
Oct. 2, 1876.	HASTINGS, CHARLES S.,	. . .	<i>Physics.</i>
May 7, 1877.	LANMAN, CHARLES R.,	. . .	<i>Sanskrit.</i>
June 3, 1878.	ADAMS, HERBERT B.,	. . .	<i>History.</i>

RESIDENT LECTURER.

June 5, 1876. RABILLON, LEONCE, . . . *French.*

NON-RESIDENT LECTURERS.

Appointed.		Courses.
1876.	BILLINGS, JOHN S., <i>Medical History, etc.</i>	One.
1876.	CHILD, FRANCIS J., <i>Early English.</i>	Three.
1876.	COOLEY, THOMAS M., <i>Law.</i>	Two.
1876.	HILGARD, JULIUS E., <i>Geodetic Surveys.</i>	One.
1876.	LOWELL, JAS. RUSSELL, <i>Romance Literature.</i>	One.
1876.	MALLET, JOHN W., <i>Technological Chemistry.</i>	Two.
1876.	NEWCOMB, SIMON, <i>Astronomy.</i>	One.
1876.	WALKER, FRANCIS A., <i>Political Economy.</i>	Two.
1876.	WHITNEY, WILLIAM D., <i>Comparative Philology.</i>	One.
1877.	ALLEN, WILLIAM F., <i>History.</i>	One.
1878.	JAMES, WILLIAM, <i>Psychology.</i>	One.
1878.	MOBBIS, GEORGE S., <i>Philosophy.</i>	Two.
1878.	DIMAN, JEREMIAH L., <i>History.</i>	One.
1878.	VON HOLST, H., <i>History.</i>	One.

FELLOWS.

Appointed.	Corrected to October, 1878.	Retired.
1876.	ADAMS, HENRY C., Ph. D., Student in the University of Heidelberg.	
1876.	ADAMS, HERBERT B., Ph. D., Associate in History; Lecturer in Smith College, Mass.	1878.
1876.	BROOKS, WILLIAM K., Ph. D., Assistant Professor of Comp. Anat.	1876.
1876.	CRAIG, THOMAS, Ph. D., Fellow in Physics.	
1876.	GORE, JOSHUA W., C. E., Professor in S. W. Baptist Univ., Jackson, Tenn.	1878.
1876.	HALSTED, GEORGE B., A. M., Tutor in Mathematics, Princeton Coll.	1878.
1876.	HART, EDWARD, B. S., Assistant Professor of Chem., Lafayette Coll.	1878.
1876.	HERING, DANIEL W., C. E., Civil Engineer.	1878.
1876.	ILES, MALVERN W., Ph. D., Chemist, Colorado.	1878.
1876.	JACQUES, WILLIAM W., S. B., Fellow in Physics.	
1876.	LANMAN, CHARLES R., Ph. D., Assistant Professor of Sanskrit.	1877.
1876.	MEANS, D. MACGREGOR, A. B., Professor in Middlebury Coll., Vt.	1877.
1876.	MORSE, HARMON N., Ph. D., Assistant Professor of Chemistry.	1876.
1876.	PAGE, WALTER H.,	1878.

APPENDIX.

47

Appointed.	Retired.
1876. POINIER, P. PORTER, Died in June, 1876.	1876.
1876. PRESTON, E. DARWIN, B. C. E., Civil Engineer.	1878.
1876. RICE, HENRY J., S. B.,	1878.
1876. ROYCE, JOSIAH, Ph. D., Assistant Professor of Literature, Univ. of Cal.	1878.
1876. SIHLER, ERNEST G., Ph. D., Fellow in Greek History.	
1876. VAN VORST, FREDERICK B., A. B.,	1877.
1876. WHEELER, JOHN H., A. B., Fellow in Classics of Harv. Univ.; Student in the Univ. of Bonn.	1877.
1877. CLARKE, SAMUEL F., Ph. B., Fellow in Biology.	
1877. HALL, LYMAN B., Ph. D., Fellow in Chemistry.	
1877. SAVAGE, A. DUNCAN, A. M., Fellow in Greek.	
1877. FRANKLIN, FABIAN, Ph. B., Fellow in Mathematics.	
1877. SIHLER, CHRISTIAN, M. D., Fellow in Biology.	
1877. ALLINSON, FRANCIS G., A. B., Fellow in Greek.	
1878. BLOOMFIELD, MAURICE, A. M., Fellow in Philology.	
1878. FAHLBERG, CONSTANTINE, Ph. D., Fellow in Chemistry.	
1878. HALL, EDWIN H., A. B., Fellow in Physics.	
1878. HARDING, EDWARD C., A. M., Fellow in Greek.	
1878. OTT, ISAAC, M. D., Fellow in Biology.	
1878. SEWALL, HENRY, S. B., Fellow in Biology.	
1878. STRINGHAM, WASHINGTON I., A. B., Fellow in Mathematics.	
1878. YOUNG, ABRAM V. E., Ph. B., Fellow in Chemistry.	
1878. HEMPHILL, CHARLES R., A. M., Fellow in Greek.	
1878. MARQUAND, ALLAN, A. B., Fellow in Philosophy.	
1878. VAN VELZER, CHARLES A., B. S., Fellow in Mathematics.	

GRADUATES.

1878.

HENRY C. ADAMS, . . .	Ph. D.
THOMAS CRAIG, . . .	Ph. D.
ERNEST G. SIHLER, . . .	Ph. D.
JOSIAH ROYCE, . . .	Ph. D.

UNIVERSITY SCHOLARS.

1876.

G. W. MCCREARY.

A. SPRIGG.

1877.

E. H. SPIEKER.

B.

Publications.

CHARTER; FOUNDER'S WILL; BY-LAWS. 1874.

INAUGURAL ADDRESSES. Feb. 22, 1876.

ANNUAL REPORTS OF THE PRESIDENT:

First. January 1, 1876.

Second. January 1, 1877.

Third. September 1, 1878.

OFFICIAL CIRCULARS ISSUED IN 1876-7:

1. Preliminary Information.
2. Admission of Scholars.
3. Bestowal of Fellowships.
4. Partial Arrangements for Instruction.
5. Register of Members of the University.
6. List of Periodicals.
7. Register for the Preliminary Year, (second edition.)
8. Instruction in Chemistry, Physics and Biology.
9. Synopsis of Lectures on "Torts," by Judge Cooley.
10. Programme for the Year, 1877-8.
11. Announcement of a course preliminary to Medicine.

OFFICIAL CIRCULARS ISSUED IN 1877-8:

1. Instruction in Physiology for School Teachers.
2. Register for the Second Year.
3. Synopsis of Lectures by Professor Cooley.
- Synopsis of Lectures by Professor Allen.
4. Bestowal of Fellowships

(The numerical sequence was here given up.)

Programme of Mathematical Courses for 1878-9.

Programme of Biological Courses for 1878-9.

Programme of Chemical Courses for 1878-9.

Programme of Collegiate Courses for 1878-9.

Programme of Philological Courses for 1878-9.

Programme of Preliminary Medical Course for 1878-9.

Programme of Courses in Romance Languages for 1878-9.

Programme of Historical Courses for 1878-9.

SCIENTIFIC PAPERS:—published under the auspices of the University:

American Journal of Mathematics:

No. 1. March, 1878.

2. July, 1878.

3. September, 1878.

4. (in press.)

Notes from the Chemical Laboratory:

No. 1- 3. May, 1877.

4- 8. December, 1877.

9-12. June, 1878.

Notes from the Biological Laboratory:

(in preparation.)

MISCELLANEOUS PAPERS:

Suggestions in respect to a School of Practical Astronomy by Prof. Newcomb, Dec. 18, 1878.

Extracts from Lectures on Medical Education by Dr. Billings.

Reference List of Books on Philosophy, (for Prof. Morris.)

Reference List of Books on Political Economy, (for Prof. Walker.)

Reference List of English and Scotch Ballads, (for Prof. Child.)

First Bestowal of Degrees, June 18, 1878, (Broadside.)

Reception of Dean Stanley, Sept. 30, 1878.

C.

Report of Chesapeake Zoölogical Laboratory.

Summer of 1878.

To the President of the Johns Hopkins University:

DEAR SIR: I have the honor to submit to you the following report of the Chesapeake Zoölogical Laboratory of the University for the summer of 1878

The Trustees of the University having given their consent to the establishment, as a branch of the biological department of the University of an experimental sea-side Laboratory for the study of the zoölogy of the Chesapeake Bay, I visited the lower part of the bay last April in order to select the best place for the experiment. The configuration of the bay is such that, if other things were equal the proper site for a laboratory would be at or very near the southern point of the eastern shore. Most of the fresh water enters the bay upon the western side, and there is accordingly an outward current of somewhat brackish water down the western shore, while the pure salt water, brought in from the ocean by the tide, sets in most strongly along the eastern shore, which is, therefore, a favorable point for the collection of many strictly marine animals which are not found upon the opposite side.

On visiting the eastern shore I found that there are no buildings proper for use as a laboratory in a fit place, and this, together with the unhealth-

fulness of this shore, induced me to forego the advantages of a location close to the open ocean and to select a point upon the western shore.

On this side of the bay several good places were found, but the best appeared to be the incompleted fortification known as Fort Wool. This is an artificial island made by dropping granite rocks into the water, thus elevating an area of about six acres above high tide level. The fort is situated in the mouth of Hampton Roads, about one mile and a half from one shore and three miles from the other, and about twenty miles from the ocean.

The area of six acres is almost covered with the incompleted fortification and building material, and the available space is thus reduced to about half an acre. In this space are two large frame buildings, well lighted, near the water, and adapted for use as a laboratory. Application was accordingly made, near the end of April, to Major-General Q. A. Gilmore, the officer in charge of the property, for permission to occupy them for the summer for that purpose. Through the kindness of the late Professor Henry and of Professor Baird, the Secretary of War was also informed in regard to the nature of the project, and on May 22d, the following permission was received from General Gilmore:

"OFFICE OF THE CHIEF OF ENGINEERS,

"Washington, D. C., May 20th, 1878.

"LIEUT. COL. Q. A. GILMORE,

"Corps of Engineers,

"New York City.

"SIR:—The letter of Dr. W. K. Brooks of the Johns Hopkins University of Baltimore requesting permission, to occupy, with his class the buildings at Fort Wool, Va., to be used as a laboratory and quarters during the summer, which was referred by you to this Office, May 7, 1878, with favorable recommendation, was duly received and forwarded to the Secretary of War, with the following enclosement:

"OFFICE OF THE CHIEF OF ENGINEERS,

"Washington, May 9th, 1878.

"Respectfully forwarded to the Honorable the Secretary of War.

"It is recommended that permission be granted to occupy the buildings for the purpose specified, subject to such regulations as may be established by Lieut. Col. Gilmore.

"(Signed) A. A. HUMPHREYS,

"Brig. Gen. Chief of Engineers.

"It has been received back endorsed as follows:

"Granted as recommended by the Chief of Engineers.

"By order of the Secretary of War,

"(Signed) H. T. CROSBY,

"May 16th, 1878.

"Chief Clerk.

"Copies of both endorsements are furnished for your information and guidance.

"By command of Brig. Gen. Humphreys,

"Very respectfully,

"Your obed't servant,

"(Signed) W. J. TWINING,

"Major of Engineers.

"The foregoing copy of the correspondence on the subject of the request of Dr. W. K. Brooks of the Johns Hopkins University, Baltimore, Md., is respectfully furnished for his information.

"There are no regulations that I wish to establish except that the duties of the Fort Keeper at Fort Wool are not to be interfered with, and that the Johns Hopkins University will hold itself responsible for any loss or damage to the property of the United States in the fort, resulting from its occupancy by the University students.

"Very respectfully,

"(Signed) Q. A. GILMORE,

"Lieut. Col. of Engineers,

"Brev't Maj. Gen., U. S. A."

The Trustees of the University having complied with the above conditions, a circular was issued May 22d, and the necessary outfit was purchased, and the laboratory was opened at Fort Wool on Monday, the 24th of June, 1878, and was occupied until Monday, August 19th, or eight weeks.

Owing to the unavoidable postponement of the announcement of the proposed laboratory until so short a time before the opening, the number of applicants for admission, was quite small, and many persons who would have been glad to join the party were prevented by other plans which they had formed for the summer.

MEMBERS OF PARTY.—The following is the list of scientific student of the party:

W. K. BROOKS, *Associate in Biology, Johns Hopkins University.*

* P. R. UHLER, " " " " " "

H. SEWALL, *Fellow, Johns Hopkins University.*

H. J. RICE, " " " " " "

CHR. SIHLER, " " " " " "

AUGUST SCHMIDT, *Teacher of Nat. Science, Zion School, Baltimore.*

N. B. WEBSTER, *Prin. Webster Military Acad., Norfolk, Va.*

T. B. WEBSTER, M. D., " " " " " "

MRS N. B. WEBSTER, " " " " " "

* W. R. BOOKER, M. D., *Baltimore, Md.*

The above party, with the two exceptions noticed, were at Fort Wool during the whole or the greater part of the session.

LIBRARY AND OUTFIT.—Twelve microscopes, a number of reagent bottles and reagents, and twelve lecture-room chairs, were taken to Fort Wool from the Biological Department of the University.

Those books in the University Library which were likely to be of use to us during the summer, were taken with us, and a small room, furnished with shelves, was set apart at Fort Wool as a library. A number of important books, which our own library does not contain, were sent to us from the Library of Congress at Washington, through the Smithsonian Institution. My own zoological library was placed at the disposal of the students, and a few other books were lent us.

The Superintendent of the Maryland Fish Commission allowed us to take with us a large seine belonging to the Commission, and through his kindness three large row boats, the property of the Maryland Commission, were sent to us from Washington by the United States Commission.

The United States Fish Commission also sent us a small dredge.

The remainder of the outfit was purchased by the University, and consisted of microscopic material and glass ware, laboratory tables and chairs, aquaria, tubs, buckets, nets, a dredge and other collecting apparatus, and cooking utensils and table furniture for a party of twelve persons.

BOATS.—Professor Baird, of the Smithsonian Institution, attempted to obtain for us, from the Navy Department the use of a stean launch, but, at the time for opening the laboratory, he had not succeeded, and as it was necessary for us to have daily communication with the shore from the first, I was unable to wait, and engaged a sail-boat and boatman.

Although our failure to obtain the launch was a great disappointment, it proved to be for the best, as the expense would have compelled us to cut our session short nearly one-half, and an acquaintance with the neigh-

* With the party only a few days.

boring waters has shown me that a small launch would not have been of very great value to us, as it would not have enabled us to safely reach essentially different waters from those immediately around us.

Much valuable help was afforded us by the captains of steam tugs, several of whom took our party out on short dredging excursions. As this service was gratuitous, and could not be allowed to interfere with business, the excursions were necessarily very short, but, nevertheless, very advantageous to us.

Two captains especially, Capt. Milton S. Lawrence and Capt. D. S. Leffer, took an intelligent interest in our work, and gave us every facility in their power for furthering our investigation. The help which these gentlemen gave us deserves mention, as they were the owners of their boats, and, in addition to the running expenses, they, at all times, took the risk of losing an opportunity for employment, by the delay which the necessity for carrying our party back and landing us, might cause them.

The U. S. Quartermaster at Fort Monroe placed the revenue cutter, which is in his charge, at our service for two hours, a few days before the laboratory closed, and thus enabled us to make a short dredging excursion, which yielded interesting results.

CHARTS. &c.—Application was made to the U. S. Coast Survey for charts, and the government charts of the waters within a radius of fifty miles of Fort Wool, were sent us, but, by some mistake, they did not reach me until after the closing of the laboratory.

As the fishery laws of the State of Virginia prohibit dredging and fishing in certain waters of the State during summer, application was made to the Governor for exemption from the restrictions of these laws, and through his action the following permission was received from the Fish Commissioners of Virginia:

"The Johns Hopkins University having established a station in the vicinity of Fortress Monroe for the study of marine zoölogy, and it being of the greatest importance to science and to the interests of the State that every liberty or facility should be given to the free prosecution of the investigations proposed, therefore Permission is given to Prof. W. K. Brooks in charge of such station, and to all of his students to take from any of the waters of the Commonwealth, by such means as are most convenient such fish or shells or other forms of invertebrate life as may be needed as material for the proposed investigations.

"(Signed) M. McDONALD.

"Com'r. of Fisheries, Va."

THE LABORATORY—The Laboratory was designed to accomplish four objects: to furnish advanced students with opportunities for original investigation; to provide material for winter work in the University; to enable less advanced students to become acquainted with the many interesting forms of life which can be studied only at the seashore, and to give them an opportunity to become practically acquainted with the methods of marine zoölogical work; and to increase our scientific acquaintance with the zoölogy of the Chesapeake Bay.

The in-door facilities for advanced investigation were perfectly adequate, and I do not know of anything which was wanting which it would be worth while to buy for a temporary laboratory.

As regards the out-of-door facilities, an abundant supply of interesting material for study could be collected without leaving the fort. A strong current runs close to the walls of the fort, and thus carries a great body of water—fifteen or twenty miles—past its walls at each turn of the tide. Free-swimming animals were thus carried by in great numbers, and the water was full of embryos and the free-swimming larva of fixed animals which were not to be found in our immediate vicinity. Although we were too far from the ocean to meet with any strictly pelagic forms, and

our fauna was thus somewhat restricted, there was, at all times an abundant supply of material for study, and the facilities for embryological work were fully equal to those of any zoological station upon our coast.

The opportunities for collecting and studying adult animals were by no means so good, for, while we had embryos of all kinds brought to us by the water, the mature animals could only be obtained by going to them. The nature of the bottom in the vicinity of Fort Wool is such that the results obtained by dredging were not very satisfactory, and as we had no means for making extended dredging and collecting excursions, we were unable to find many interesting animals which were shown, by the presence of their embryos at Fort Wool, to be quite numerous within fifteen or twenty miles of us. The collections of adult animals brought back to Baltimore for laboratory work were, for this reason, quite small, although we succeeded in getting a good supply of a few very desirable types.

The opportunities afforded to the less advanced students were also satisfactory.

No lectures were given, as the needs of the different members of the class were too diverse to make lectures advantageous.

Each student had access to the library, and the proper reading to be done in connection with the study of each form of life was pointed out by the Associate in charge. They had the benefit of all the distant excursions which we were able to make, and were thus enabled to become familiar with the methods of deep-water collecting; and there was at least one surface-collecting excursion every day of the season, and more than one on every favorable day.

There were also several shore-collecting expeditions, and both sides of Hampton Roads were visited and examined. In these ways the students were able to acquire familiarity with the habits of marine animals while gathering the material for laboratory work.

In the Laboratory, each student had ample room for dissecting and for microscopic work, as well as all the necessary facilities for keeping and observing living animals in aquaria. Only one of the students, during the past summer, had ever done any work in marine zoology before, but if the laboratory should be continued, several of the class would be able to take up subjects for original investigation next year.

SCIENTIFIC RESULTS.—The amount of advantage which zoological science can derive from the discovery and description of new species is very slight, as compared with that which is gained by the careful study of the whole life-history of any form of life—old or new. As this work can be done only where the living animals can be had, it is properly *laboratory* work, as distinguished from *museum* work, or the identification of species.

I accordingly made no attempt to find and describe new forms, but devoted all our time to the careful study of a few important species; selecting for this purpose, from among those which were abundant at our station, the ones a knowledge of which is most desirable to science. I may say, however, that two of the forms which we selected for careful study were new additions to the fauna of this region.

One of these, *Amphioxus*, was studied by Mr. Rice

Amphioxus is a small worm-like animal, the lowest of the vertebrates, and it is of very great scientific interest since it has preserved many evidences of a relationship to various groups of invertebrates, and thus serves to bridge over the gap which was supposed by Cuvier and Agassiz to separate the vertebrata from all lower forms of life.

Its embryology, which may be termed the key to the embryology of all the higher animals, has been ably studied by several of the most dis-

tinguished zoölogists of Europe, and a number of papers have appeared upon the subject within a few years. We fortunately found several larvae which had passed beyond the stages studied by these naturalists, but which had not yet acquired the adult characteristics. Mr. Rice succeeded in keeping these alive, and was thus able to supply the information necessary to complete our knowledge of its development. He also made very interesting observations upon the habits of *Amphioxus*. *Amphioxus* has been found upon the coast of South Carolina, and last winter one of the assistants of the Smithsonian Institute discovered it in the Bermudas; until this summer these were the only instances of its occurrence upon this side of the Atlantic.

Another important form of life which was carefully studied, is *Lingula*, one of the Brachiopoda, a group which has been of great importance during past geological periods, but has now almost disappeared. *Lingula* itself has persisted unchanged from the time of formation of the oldest fossiliferous rocks, and is one of the first living things of which we have any knowledge. As *Lingula* has not before been found under circumstances which admitted of careful study, almost nothing was known of its development, but I was able to trace its life history this summer from a very early stage up to the adult form, and to show that, old as it is, each individual, from the time of the lower Silurian up to the present time, has transmitted to its children a developmental record which proves that *Lingula* itself is the descendant, of a much older form. It is hoped that a publisher will soon be found for these and other papers which will give the scientific results of our summer's work in full.

At the opening of the Laboratory, we hoped to be able to study the development of the oyster, but we found that we were too late by several weeks. What little information we were able to obtain has been placed at the disposal of the Fish Commissioner of Virginia.

At the close of our season, Mr. Rice joined the U. S. schooner *Palinurus*, which had been sent by the U. S. Coast Survey to investigate the physical geography of the oyster beds of the Chesapeake.

A report of our Summer's work would be incomplete without an expression of the indebtedness of our party to Mr. Walter Allen, the Keeper of Fort Wool, whose constant efforts to make our life at the fort pleasant and our property safe, were warmly appreciated by all of us.

Yours truly,

W. K. BROOKS.

D.

Johns Hopkins Philological Association.

TITLES OF THE PRINCIPAL PAPERS PRESENTED IN THE ACADEMIC YEAR 1877-78.

1. The Two Original *ka*-sounds in Indo-European. Oct. 6, 1877. By Dr. LANMAN.
2. A Literary Survey of the Myths in Plato. Nov. 2, 1877. By Mr. SIKLER.
3. Schiller's Ethical Studies. Dec. 7, 1877. By Mr. ROYCE.

4. Do the Romance Languages hold the same Relation to the Latin that the Modern Prakrit Dialects do to Sanskrit? Jan. 4, 1878 By Mr. ELLIOTT.
5. The Oaths in the Greek Orators. Feb. 8, 1878. By Mr. SAVAGE.
6. The Home of the Shemitic Peoples. March 1, 1878. By Mr. MURRAY.
7. On Prepositions. April 5, 1878. By Mr. BRANDT.
8. A Critical Review of Kirchhoff's Treatises—"Upon the Time of the Composition of Herodotus' History." May 3, 1878. By Professor MORRIS.

LIST OF MINOR COMMUNICATIONS PRESENTED DURING THE ACADEMIC
YEAR 1877-78.

1. On the name "Pompeji." By Mr. LANMAN.
2. On the name "Shiloh" (Shilôh). By Mr. MURRAY.
3. A Criticism of Merivale's Account of the scandalous Bargain made by two of the Consular Candidates with the Consuls for B. C. 51, recorded by Cicero, *ad Att.* iv. 18. 2. By Professor MORRIS.
4. The Non-identity of *-ter* and *-der* in some Germanic Prepositions (*hinter, nieder, under, etc.*), with the comparative Endings *-tara* and *-repe-s*. By Mr. BRANDT.
5. Remarks upon a Cretic Inscription running from right to left and from left to right, now deposited in the Louvre (with description of paper cast thereof). By Mr. LANMAN.
6. A Chapter from the Attic Law of Inheritance. By Mr. SIHLER.
7. On the Origin of the Hexameter. By Prof F. D. ALLEN of Cincinnati. (Read by Mr. LANMAN.)
8. On the Relation of *herde, hort, horde, hürde*. *Horde* is not Indo-European. By Mr. BRANDT.
9. On the Historical Development of the Forms of the Instrumental Singular Masculine of *a*-stems in Sanskrit, with a Criticism of the Views of Schleicher. By Mr. LANMAN.
10. The Contributions of Schanz to Platonic Text-Criticism. By Mr. SIHLER.
11. Review of Lindner's "*Altindische Nominal-bildung*." By Mr. LANMAN.
12. The *Ars Rhetorica* of Dionysius of Halicarnassus. By Mr. SIHLER.
13. On the Oath of Rhadamanthus. By Mr. SAVAGE.
14. On the use of the Three Attributive Positions of the Possessive Pronoun in Herodotus, Lysias, Demosthenes, and Isocrates. By Mr. ALLINSON.
15. On the name *Σαρχωνιάδων*. By Mr. MURRAY.
16. The Life, Work, and Spirit of August Schleicher. By Mr. LANMAN.
17. The use of Capital Letters in writing and printing German By Mr. BRANDT.
18. A Review of Edw. T. Williams' Work "The Science of French Conjugation." By Mr. EDW. A. FAY of Washington. (Read by Mr. LANMAN.)

The average number of members present was 13.

Historical and Political Science Association of the Johns Hopkins University.

TITLES OF THE PRINCIPAL PAPERS READ DURING THE ACADEMIC YEAR, 1877-8.

1. The Village Communities of Ancient Germany and Mediæval England. An Introduction to the Study of New England Towns and the Institutions of Local Self-Government in America. By H. B. ADAMS.
2. The Ordinance of 1787 for the Government of the North-Western Territory. A paper showing the historic origin of this Act of National Legislation and the importance of the Ordinance as an element of Constitutional Law. By AUSTIN SCOTT.
3. The Economy of Coöperation. An Essay afterwards read before the *American Social Science Association* at its meeting in Cincinnati. By H. C. ADAMS.
4. The *Tractatus Theologico-Politicus* of Spinoza. A Philosophical Essay in which Spinoza was presented as the champion of religious liberty. By JOSIAH ROYCE.
5. The Punitive Power of the State. An inquiry into the grounds of legal punishment and an examination of the views advanced in Woolsey's *Political Science*. By WILLIAM T. BRANTLY.
6. The Public School System; an inquiry as to its Foundations. By D. C. GILMAN.

LIST OF SOME OF THE MINOR COMMUNICATIONS PRESENTED DURING THE ACADEMIC YEAR, 1877-8.

1. Tramps. A paper afterwards read before a public convention, in Baltimore, of Maryland gentlemen, for the discussion of the tramp-question. By H. C. ADAMS.
2. The Maryland State Papers. A communication showing the wealth of historical materials now lying unpublished at Annapolis and in the library of the Maryland Historical Society. By H. B. ADAMS.
3. The National Archives. An explanation of the character and arrangement of the public documents and historical collections (letters, manuscripts, etc.) belonging to the United States. By AUSTIN SCOTT.
4. The Influence of Alexander Hamilton in the Formation of the Constitution of the United States. By JOSEPH H. TYLER.
5. The Original Conception of the Town as an Institution. By W. F. ALLEN, of the University of Wisconsin.
6. Greek Cities. Fragments from Greek writers, illustrating the historical village community and the Federal Constitution of the Commonwealths of Greece. By A. D. SAVAGE.
7. Review of the Statistics of Bengal and of the Indian Systems of Land-Tenure. By C. R. LANMAN.
8. Review of Dr. Woolsey's Theories Concerning the Educational Power of the State. By D. C. GILMAN.
9. The School System of Connecticut, with Particular Reference to that of New Haven. By F. A. WALKER, of Yale College.
10. The School System of Baltimore. By Judge GEO. WM. BROWN.

Besides the consideration of such themes as the above, it is the practice of the Association to review the current magazine literature, (English, German and French,) relating to historical and political science.

Scientific Association of the Johns Hopkins University.

LIST OF PAPERS PRESENTED DURING THE ACADEMIC YEAR, 1877-78.

1. On Diamagnetic Experiments. By W. W. JACQUES.
2. On the Early Stages in the Development of Gasteropods. By W. K. BROOKS.
3. A resumé of Maxwell's Theory of Light. By H. A. ROWLAND.
4. On the oxidation of Mesitylene Sulphamide. By L. B. HALL.
5. An Historical Sketch of the Science of Linkage. By G. B. HALSTED.
6. A Review on the Expenditure of Energy by Working Muscle. By H. N. MARTIN.
7. Some new experiments on the mechanical equivalent of heat. By H. A. ROWLAND.
8. On the formation of the female pelvis. By C. SIHLER.
9. On an application of modern chemistry to modern algebra. By J. S. SILVESTER.
10. On the oxidation of xylene sulphonic acids. By M. W. ILKS.
11. On the theory of the elastic relations of crystals. By W. E. STORY.
12. A review of some recent investigations in Valence. By IRA REMSEN.
13. On the education of women from a zoölogical standpoint. By W. K. BROOKS.
14. On a true criterion for color correction in the astronomical objective. By C. S. HASTINGS.
15. On the influence of stimulation of the optic lobes upon the respiratory centre of the frog. By H. N. MARTIN.
16. A note on recent experiments on the liquefaction of gases. By H. A. ROWLAND.
17. Contributions toward a history of the Maryland Cambari. By P. R. UHLER.
18. Nitro-sulpho-benzoic Acids. By E. HART.
19. A resumé on the theory of Groups. By W. E. STORY.
20. The Urodela of North America. By S. F. CLARK.
21. On iron supports for bridges. By D. W. HERING.
22. On Van't Hoff's Hypothesis. By IRA REMSEN.

[E.]

List of Donors to the Library, Jan. 1, 1877, to Sept. 1, 1878.

GIFTS OF BOOKS HAVE BEEN RECEIVED AS FOLLOWS:

- From Prof. HENRY ADAMS, the Author. *New England Federalism*. Boston, 1877. O.
 J. CARSON BREVOORT, LL.D., the Author. *Verrazano, the Navigator*. New York, 1874. O.
 Hon. N. BOOTH, U. S. Senate. *Reports of the U. S. Commissioners to Vienna Exhibition*. Wash., 1876. 4 vols. 8vo.
 R. K. BEER, Ph.D., the Author. *Pharmaceutical Terminology*. Balt., 1876. 12mo.
 B. D. BARROLL, the Author. *Maryland Equity*. Baltimore, 1878. O.
 CLARK & MAYNARD, the Publishers. *Grammaire Française moderne*, par Victor Alvergnot. New York, 1877. 12mo.
 Etienne-Henry French Grammar, by J. G. Keetels. New York, 1877. 12mo.

- From CLARK & MAYNARD, the Publishers. Analytical and Practical French Grammar, by J. G. Keetels. New York, 1877. 12mo.
- GEO. H. CALVERT, the Author. Life of Rubens. Boston, 1876. 12mo.
- Dr. J. S. CONRAD, Report of the Board of Managers of the Maryland Hospital for the Insane. Dec. 1876. Baltimore.
- Hon. T. M. COOLEY, the Author. A Treatise on the Law of Taxation. Chicago, 1876. O.
- Prof. GEO. H. COOK, State Geologist, Geological Survey of N. J. Report on Clays. Trenton, 1878. O.
- Tenth Annual Report of the State Board of Agriculture, for 1876. Trenton, 1877. 8vo.
- Hon. GEO. H. CROSWELL, Governor of Michigan. Geological Survey of Michigan, 1861-73; New York, 1873-76. 3 vols. O.
- CUSHINGS & BAILEY, Publishers' Trade List Annual, 1877. New York, 1877. 8vo.
- Prof. A. J. DU BOIS, the Translator. Weyrauch, on Structures of Iron and Steel. New York, 1877. 8vo.
- Hon. J. EATON, Commissioner. Report of the Commissioner of Education, for 1876. Washington, 1878. O.
- H. R. H. GASTON D'ORLEANS, Count d'Eu. Brazilian biographical annual, by J. M. de Macedo. Rio de Janeiro, 1876. 3 vols. 8vo.
- TOWNEND GLOVER. Manuscript Notes of Insects, Native and Foreign; Order Hemiptera; Sub-order Heteroptera. Washington, 1876. a. F.
- SAMUEL GARNER. Maryland Convention, 1850. Annapolis, 1850. O.
- J. O. HALLIWELL PHILLIPS, the Author. Illustrations of the Life of Shakespeare. Part I. London, 1874. Fol.
- Catalogue of his Shakespeare-Study Books. London, 1876. 8vo.
- Brief Hand List. London, 1876. 8vo.
- Brig. Gen. A. A. HUMPHREYS, Chief of Engineers, U. S. A. U. S. Geological Exploration of 40th Parallel, under Clarence King. Vol. 2. Descriptive Geology, by Arnold Hague and S. F. Emmons. Washington, 1877. Q.
- Same. Vol. 4, Palaeontology. Washington, 1877. Q.
- Annual Report of the Chief of Engineers. Washington, 1876. 3 vols. 8vo.
- Report of a reconnaissance from Carroll, Montana, etc., by W. Ludlow. Washington, 1876. 4to.
- M. W. ILES, Ph. D. Proceedings of the Davenport Academy of Natural Sciences. Vol. 1. Davenport, Iowa, 1876. 8vo.
- Formule for Railroad Excavation, etc., by J. W. Davis. New York, 1876. 8vo.
- DR. JOSEPH JONES, the Author. Explorations of the Aboriginal Remains of Tennessee. Washington, 1876. 4to.
- REVERDY JOHNSON. Das Recht des Besitzes, by Friedrich Carl von Savigny. Giesesen, 1837. 8vo.
- Die formellen Verträge des neueren römischen Obligationenrechts, by Heinrich R. Gneist. Berlin, 1845. 8vo.
- Hon. T. J. KNOX. Report of Comptroller of Treasury, Dec. 3, 1877. Washington, 1877. O.
- J. W. M. LEE. Historical Research respecting the opinions of the Founders of the Republic on Negroes as Slaves, as Citizens, and as Soldiers, by George Livermore. Boston, 1862. 8vo.
- Prof. T. C. MURRAY. Biblical Repertory and Princeton Review, Philadelphia and New York, 1830-64. 35 vols. 8vo.
- Prof. H. N. MARTIN. Journal of Physiology. Ed. M. Foster. For the year. Arbeiten aus der physiologischen Anstalt zu Leipzig. 7ter Jahrgang, 1872. Von C. Ludwig. Leipzig, 1873. 8vo.
- Hon. JOHN T. MORRIS, President. Forty-eighth Annual Report of the Board of Commissioners of Public Schools for 1876. Baltimore, 1877. 8vo.
- JOHN MURPHY, the Publisher. The History of the Protestant Reformation in Germany and Switzerland, by M. J. Spalding, D. D. 7th ed. Baltimore, 1876. 2 vols. 8vo.
- Miscellanea, comprising reviews, lectures and essays, by M. J. Spalding, D. D. 6th ed. Baltimore, 1875. 2 vols. 8vo.
- Evidences of Christianity, by M. J. Spalding, D. D. 6th ed. Baltimore, 1876. 8vo.
- European Civilization, by J. Balme. 16th ed. Baltimore, 1860. 8vo.
- Rituale Romanum, Pauli V Pontificis maximi jussu editum et a Benedicto XIV. Baltimore, 1872. s. 8vo.
- Debates of the Constitutional Convention of the State of Maryland, 1864. Annapolis, 1864. 8vo.
- Constitution of the State of Maryland, 1867. Baltimore, 1867. 8vo.
- Concillii Plenarii Baltimorensis II, Acta et Decreta. Baltimore, 1877. 8vo.
- Maryland Code—Public General Laws, compiled by Otho Scott, and Hiram M'Cullough. Baltimore, 1860. 2 vols. 8vo.
- Supplements to the Maryland Code, containing the Acts of the General Assembly passed at the Sessions of 1861, 1861-62, 1864, 1865, 1866, 1867, 1868, and 1870. Baltimore, 1868-70. 3 vols. 8vo.

- From MACMILLAN & Co., the Publishers, New York. Holy Roman Empire, by James Bryce. 6th ed. London, 1876. cr. 8vo.
- Practical Biology, by T. H. Huxley and H. N. Martin. 3d ed. London, 1877. cr. 8vo.
- Greek-English Dictionary, by H. G. Liddell and Robert Scott. 14th ed. Oxford, 1870. post 8vo.
- Algebra, by Isaac Todhunter. 7th ed. London, 1875. post 8vo.
- Junior Course of Practical Chemistry, by Francis Jones. 3d ed. London, 1875. post 8vo.
- Osteology of the Mammalia, by W. H. Flower. London, 1870. post 8vo.
- Chemistry, by A. W. Williamson. 3d ed. Oxford, 1873. post 8vo.
- Popular Astronomy, by Geo. B. Airy. 7th ed. London, 1868. post 8vo.
- Elementary Physiology, by T. H. Huxley. 10th ed. London, 1876. post 8vo.
- Elementary Chemistry, by H. E. Roscoe. 2d ed. London, 1875. post 8vo.
- Elementary Anatomy, by St. G. Mivart. London, 1873. post 8vo.
- Political Economy for Beginners, by Mrs. M. G. Fawcett. 4th ed. London, 1876. post 8vo.
- Elementary Physics, by Balfour Stewart. New ed. London, 1873. post 8vo.
- Elementary Astronomy, by J. N. Lockyer. London, 1876. post 8vo.
- Elementary Treatise on Steam, by John Perry. London, 1874. post 8vo.
- Historical English Grammar, by Richard Morris. 3d ed. London, 1877. post 8vo.
- Elements of Embryology, by M. Foster and Francis Balfour. London, 1874. post 8vo.
- Political Economy, by Henry Fawcett. 5th ed. London, 1876. post 8vo.
- Algebra for Beginners, by Isaac Todhunter. New ed. London and New York, 1876. post 8vo.
- Natural Philosophy for Beginners, by Isaac Todhunter. London, 1877. post 8vo.
- NASHVILLE BOARD OF HEALTH. Second Report of the Board of Health to the City Council, for the year ending July 4, 1877. Nashville, 1877. 8vo.
- NEW YORK PRODUCE EXCHANGE. Annual Report of the Board of Managers for the year ending June 1st, 1876. New York, 1877. 8vo.
- Mrs. BURR PORTER. (In commemoration of C. Porter Poinier, a Fellow of this University.)
- Calcul différentiel et intégral, by S. F. La Croix. 3 vols. 2d ed. Paris, 1810-19. Q.
- Exercices de calcul intégral, by A. M. Legendre. Paris, 1811. Q.
- Lectures on Natural Philosophy, by Thomas Young. 2 vols. London, 1807. Q.
- Infinitesimal Calculus, by Bartholomew Price. 3 vols. Oxford, 1857-68. 8vo.
- Cours de Physique, by J. Jamin. 3d ed. 3 vols. Paris, 1869-71. 8vo.
- Differential Equations, by Geo. Boole. 3d ed. London, 1872. 12mo.
- Wärmetheorie, by Robert Roentgen. Jena, 1871 and 74. 8vo.
- Mechanics, by S. D. Poisson. Translated from the French by H. H. Harte. 2 vols. London, 1842. 8vo.
- History of Calculus of Variations in 19th Century, by Isaac Todhunter. Cambridge and London, 1865. 8vo.
- Elementary Treatise on La Place's Functions, by Isaac Todhunter. London, 1875. 12mo.
- Plane Trigonometry, by I. Todhunter. 5th ed. London, 1874. 12mo.
- Theory of Equations, by I. Todhunter. London, 1875. 12mo.
- Chimie analytique; analyse quantitative, by Henry Rose. Paris, 1862. 8vo.
- Attractions, by John H. Pratt. London and New York, 1871. 12mo.
- Sound and Atmospheric Vibrations, by G. B. Airy. 2d ed. London, 1871. 12mo.
- Partial Differential Equations, by G. B. Airy. 2d ed. London, 1878. 12mo.
- Acoustics, by W. F. Donkin. Oxford, 1870. 12mo.
- Introduction to Quaternions, by P. Kelland and P. G. Tait. London, 1873. 12mo.
- Cambridge University Mathematical Papers, 1838-49, by A. H. Frost. Cambridge, 1849. 8vo.
- Cambridge University Mathematical Problems and Examples, 1821-36. Cambridge, 1837. 8vo.
- Cambridge University Mathematical Problems, 1801-20. Cambridge, 1821. 8vo.
- Dynamics of a Particle, by P. G. Tait and W. J. Steele. 3d ed. London, 1871. 12mo.
- Nouv. Tables d'intégrales définies, by D. Bierens de Haan. Leide, 1867. Q.
- Encyclopædia Metropolitana, ed. by H. J. Rose. Part I. Pure Sciences. London, 1848. Q.
- Mathematical Tracts on Lunar and Planetary Theories, by G. B. Airy. Cambridge, 1832-37. 8vo.
- A volume of thirty-nine Mathematical, Philosophical and Mechanical Tracts, by various writers. London, Edinburgh, and Cambridge, 1817 and v. y. Q.
- A volume of twenty-six Mathematical Tracts, by Buée, Herschell, Lubbock, Wod, Rutherford, etc. London, 1798 and v. y. Q.
- WILLIAM W. PASKO. Tribute to Horace Greeley. New York, 1877. 8vo.
- J. D. PUTNAM, Corresponding Secretary. Proceedings of the Davenport Academy of Natural Sciences. Vol. 2, Part 1. Davenport, Iowa, 1877. Q.
- C. P. PATTERSON, Sup't Coast Survey. Coast Survey Reports for 1870-'71-'72-'73-'74. Washington. 5 vols. Q.

From Prof. L. RABILLON, the Translator. *Le Livre de Merveilles*, par N. Hawthorne. Paris, 1865-7. 2 vols., 12mo.

ROYAL SOCIETY OF NEW SOUTH WALES. Transactions and Proceedings for 1875 Sydney, 1876. 8vo.

Transactions of the Philosophical Society of New South Wales, 1862-65. Sydney, 1866. 8vo.

Mines and Mineral Statistics of New South Wales. Sydney, 1875. 8vo.

Annual Report of the Department of Mines, New South Wales, for the year 1875. Sydney, 1876. 4to.

New South Wales: the oldest and richest of the Australian Colonies, by Chas Robinson. Sydney, 1873. 8vo.

Official Catalogue of the natural and industrial products of New South Wales forwarded to the International Exhibition of 1876, at Philadelphia. Sydney 1876. 8vo.

ROYAL OBSERVATORY, Edinburgh. Astronomical Observations made at the Royal Observatory. Vol. 14. Edinburgh, 1877. Q.

G. W. SMITH, the Author. Notes on Life Insurance. New York, 1876. 8vo.

W. O. SPROULL, Ph. D. An Extract from 'Adab-al-Katib, or the writer's guide, with translation and notes. Leipzig, 1877. O.

SMITHSONIAN INSTITUTION, Annual Reports for 1859, 1869, '70-'72, '75, '76.

Contributions to knowledge. Vols. 1-21.

Miscellaneous collections. Vols. 1, 3, 4, 6, 8, 9-12.

Prof. J. J. SYLVESTER. Travels and researches in Crete, by T. A. B. Spratt. London, 1855. 2 vols. O.

D. P. TODD, B. A. A Continuation of De Moivre's Tables of the Satellites of Jupiter to the year 1911. Washington, 1876. 4to.

E. B. TENNEY. Coronation. Boston, 1877. D.

The Silent House. Boston, 1877. D.

TRÜBNER & Co. Statistical Account of Bengal, by W. W. Hunter. London, 1875-1877. 20 vols. O.

UNITED STATES WAR DEPARTMENT. A Report to the Surgeon-General on the Transport of Sick and Wounded by Pack Animals, by George A. Otis, Asst Surg. U. S. A. Washington, 1877. 4to.

UNITED STATES DEPARTMENT OF THE INTERIOR. Register of officers and agents, civil, military, and naval, in the service of the United States, on the 30th Sept., 1877. Washington, 1878. Q.

DR. JOHN M. WOODWORTH. Annual Report of the Supervising Surgeon-General of the Marine Hospital Service of the United States for the fiscal year 1875. Washington, 1876. 8vo.

HON. W. PINKNEY WHYTE, U. S. S. Memorial Addresses on the Life and Character of Andrew Johnson, delivered in the Senate and House of Representatives, Jan. 12, 1876. Washington, 1876. 8vo.

WILLIAM WATSON, Ph. D., the Author. Civil Engineering, Public Works, and Architecture. Washington, 1875. 8vo.

A course in Descriptive Geometry. London, 1875. 4to. Text and Atlas.

A. E. WHITTAKER. Catalogue of the Mercantile Library of San Francisco, and of the Additions to 1875. San Francisco, 1875. 2 vols., 8vo.

S. WATERHOUSE, the Author. A Memorial to Congress for the Improvement of the Mississippi. St. Louis, 1877. D.

JAMES YOUNG, F. R. S., and R. ANOUS SMITH, F. R. S. Chemical and Physical Researches, by Thomas Graham. Edinburgh, 1876. Roy. 8vo.

Also, from the COMMISSIONER OF THE LAND OFFICE, Washington, D. C., a copy of the "Centennial Map of the United States," published by the Land Office.

GIFTS OF PAMPHLETS HAVE BEEN RECEIVED AS FOLLOWS:

From Amherst College Library, (3); Dr. P. Townsend Austen; H. C. Adams, Ph. D.; Argentine Republic Cent. Commission; Prof. H. C. Bolton, (2); C. M. Bliss; Boston Public Library, (6); Prof. F. P. Brewer; Dr. J. S. Billings, (24); Hon. D. Burt; Dr. W. K. Brooks; Henry Armit Brown; Dr. J. J. Chisolm; Prof. F. W. Clarke; Dr. J. R. Chadwick; Geo. W. Childs; Prof. J. P. Cooke, Jr.; J. H. Carnum & Co.; Prof. Geo. H. Cook; T. Nelson Dale, Jr.; E. S. DeForest; Dr. F. Donaldson; Prof. H. T. Eddy; Dr. A. F. Elliott; Prof. M. Foster; Rev. Thos. P. Field; Prof. D. W. Fiske; Presid't D. C. Gilman; Samuel S. Green; Prof. F. A. Genth; Rev. Chas. R. Hale, D. D., (39); Harvard University Library; George Haskell; Dr. E. M. Hunt; William Kite; Hon. F. C. Latrobe; E. L. Mark; Charles Mann; Prof. H. N. Martin, (2); Prof. O. C. Marsh; M. Merriman, Ph. D., (2); Prof. Thos. C. Murray, (4); Prof. C. E. Munroe; Lieut-Col. Garrick Mallory; Prof. J. W. Mallet, (2); Prof. R. Mallet; New York Academy of Sciences; Rev. Dr. E. D. Neill; Peabody Institute; Wm. F. Poole; Poughkeepsie Society of Natural History; President J. K. Patterson, (2); Royal Society of New South Wales, (10); Reale Accademia dei Lincei, (6); Prof. C. F. Raddatz; Dr. George W. Reuling; Hon. J. Rockwell; Stevens Institute of Technology; Prof. J. Lawrence Smith; Prof. J. J. Sylvester; Prof. N. S. Shaler, (5); Dr. Samuel O. Theobald; Prof. John Trowbridge; P. R. Uhler, (5); A. E. Whitaker; Gen. Gouveneur K. Warren; Prof. Burt G. Wilder; Worcester (Mass.) Public Library; A. S. Welch.



FOURTH ANNUAL REPORT

OF THE

JOHNS HOPKINS UNIVERSITY,

Baltimore, Maryland.

1879.

TRUSTEES.

President.

GALLOWAY CHESTON.

Treasurer.

FRANCIS WHITE.

Secretary.

WILLIAM HOPKINS.

Members of the Board.

GEORGE WILLIAM BROWN,	WILLIAM HOPKINS,
GALLOWAY CHESTON,	REVERDY JOHNSON,
GEORGE W. DOBBIN,	FRANCIS T. KING,
JOHN W. GARRETT,	C. MORTON STEWART,
CHARLES J. M. GWINN,	JAMES CAREY THOMAS,
LEWIS N. HOPKINS,	FRANCIS WHITE.

COMMITTEES.

1879.

Executive Committee:

GEORGE WILLIAM BROWN,	CHARLES J. M. GWINN,
REVERDY JOHNSON,	GEORGE W. DOBBIN,
JAMES CAREY THOMAS,	GALLOWAY CHESTON, <i>ex officio</i> .

Finance Committee:

JOHN W. GARRETT,	FRANCIS WHITE,
GALLOWAY CHESTON, <i>ex officio</i> .	

Building Committee:

GEORGE W. DOBBIN,	FRANCIS T. KING,
LEWIS N. HOPKINS,	C. MORTON STEWART,
GALLOWAY CHESTON, <i>ex officio</i> .	

Committee in Charge of the Clifton Grounds:

C. MORTON STEWART,	FRANCIS WHITE,
GALLOWAY CHESTON, <i>ex officio</i> .	

FOURTH ANNUAL REPORT

OF THE

Johns Hopkins University,

Baltimore, Maryland,

1879.

BALTIMORE:
PRINTED BY JOHN MURPHY & Co.
182 BALTIMORE STREET.
1879.

CONTENTS.

NAMES OF THE TRUSTEES.	PAGE
REPORT OF THE PRESIDENT :	
Introductory,	1
Restatement of Plans of Organization,	2
Other Scientific Foundations of Baltimore,	3
Aims of the Trustees,	4
The University and the College,	5
I. <i>Respecting Instruction</i> ,	5-15
Methods Employed,	6
Graduate Students,	8
Fellowships,	9
Collegiate Students,	18
II. <i>Literary and Scientific Apparatus</i> ,	15-22
Relations to other Libraries,	15
The Library,	19
The Laboratories,	20
III. <i>Investigation and Publication</i> ,	22-25
Opportunities for Research,	22
Scientific Publications,	23
IV. <i>Examinations and Degrees</i> ,	25-27
Character of Examinations,	25
Degrees Conferred,	25
V. <i>Public Lectures</i> ,	27-30
Summary of the Principal Courses,	28
VI. <i>Teachers' Class in Zoölogy</i> ,	31-32
VII. <i>Chesapeake Zoölogical Laboratory</i> ,	32
VIII. <i>Instruction Preliminary to Medical Studies</i> ,	32-34
IX. <i>Personal Changes</i> ,	34-36
Death of Thomas C. Murray, an Associate,	34
Recent Appointments,	35
Summary of Attendance,	35
X. <i>Public Assemblies</i> ,	36-38
XI. <i>Conclusion</i> ,	38-39
APPENDIX :	
A. Academic Staff,	41
Roll of Fellows,	42
Graduates and Holders of Scholarships,	50
B. Enumeration of Classes, 1878-79,	51
C. List of Scientific Apparatus,	56
D. Report of the Chesapeake Zoölogical Laboratory,	63
E. List of Papers Read before the Scientific Associations,	66
F. Lists of Scientific Papers Published by Members of the University, 1876-79,	68
G. Gifts to the Library,	75

FOURTH ANNUAL REPORT

OF

THE PRESIDENT.

*To the Trustees of the
Johns Hopkins University:*

GENTLEMEN:

In presenting to you a Fourth Annual Report, it seems well to sum up not only the doings of the last academic year, but also to give the results of our observations and experience during the last three years. It will be necessary to repeat occasionally some statements which have already been publicly made,—but a general review, even including such repetitions, can hardly fail to be of service to those among us who are engaged in instruction and administration,—while it will enable those at a distance, who are interested in this institution, to understand the principles and methods by which our work is governed.

The Trustees of Johns Hopkins, upon the death of the Founder, held their first meeting February

6th, 1874, and soon commenced the study of university organizations, by conferences and correspondence with the Presidents and Professors of American colleges, by personal visits to leading institutions, and by sending a representative to visit some of the most renowned seats of learning in the old world. Their plans were so far matured in the course of two years that they were publicly made known on the twenty-second of February, 1876. In the autumn of that year, the staff of teachers was brought together, and instruction began on the third of October.

The University entered upon its work with these advantages:—a large fund yielding a steady income; freedom from political and denominational control; an open field unoccupied by any endowment like ours; a central position in one of the oldest States and in the neighborhood of the great scientific establishments of Washington; a library for scholars already instituted; and the immediate prospect of a large General Hospital which may be the nucleus of a school of medicine.

The Trustees who were charged by Johns Hopkins with the oversight of this great project, early came to the conclusion that they would not attempt to rival or copy any existing institution, but would rather try to make a positive contribution to American education. They recognized

the fact that the wants of Baltimore and the region near to it were to be first considered; and they have steadily endeavored to develop an establishment which should aid and be aided by the plans and funds of other foundations, so that in time all the educational work of Baltimore may go forward in harmony.

The local institutions with which it seemed especially desirable to coöperate were these:—the Peabody Institute, having an endowment of \$1,250,000, maintaining a large and well chosen Library, a system of public lectures, a conservatory of music, and an art museum; the Johns Hopkins Hospital, the buildings of which are in process of construction; the Maryland Institute, which is the proper nucleus for a Technological School; the Maryland Academy of Sciences, which has undertaken to establish a museum of Natural History; the professional schools of Law and Medicine, and also those of Dentistry and Pharmacy; the Historical, Mercantile, Law, and Medical Libraries; the State Normal School; and—if last to be mentioned, first to be thought of—the public schools, of which, so far as boys are concerned, the City College is the head, and the private schools, maintained by individual or associated efforts.

While looking directly at local requirements, the Trustees had no desire to restrict the useful-

ness of the University to the city or the State, but were in hopes that it would attract many scholars from a distance, by the ability of its Faculty, by the wisdom of its methods, and by the fulness of its apparatus; and that by its investigations and publications its influence might extend beyond any provincial limits.

Having these aims, the next question to be considered was the interior organization of the University,—should it follow an American, an English, a French, or a German model; or should it gather from many sources educational methods to be adapted to the wants of this country and brought into harmony with our conditions, political, ecclesiastical and social. There was no hesitation on this point. The new foundation was to base its operations upon the experience of many and diverse institutions—ascertained by inquiries at home and abroad, among the most enlightened teachers and administrators.

It soon became clear that whatever nomenclature may be adopted, and whatever varieties of form may be seen in the higher educational foundations of modern times, there is an important distinction between the work of colleges and universities.

According to acknowledged precedents still rigidly followed in the old world, universities exercise these fourfold functions:—(1) they pro-

vide advanced instruction in the chief departments of literature and science,—and usually, also, in one or more of the so-called learned professions; (2) they bring together books, apparatus, instruments, works of art and collections in natural history; (3) they encourage investigation and the publication of important researches, and (4) they confer degrees.

Collegiate instruction is properly introductory to university teaching; it is elementary, formal and disciplinary. It is largely devoted to the training of the intellectual powers and the formation of habits of attention, acquisition, memory and judgment,—while it stores the mind with the elements of knowledge. A University cannot thrive unless it is based upon a good collegiate system; and it may rightly encourage or establish a college, if needed, as an important department of its activity.

Let us now examine our work in these various aspects:

1. *Respecting instruction.* Thus far no provision has been made for instruction in any of the professions,—but attention has been concentrated on those themes which are commonly spoken of as pertaining to THE PHILOSOPHICAL FACULTY OF A UNIVERSITY; and, so far as I can judge, equal regard has been shown for those subjects which are commonly classed as “scientific” and those which

are classed as "literary." There have been resident professors and assistant professors in Mathematics, Physics, Chemistry, Biology, and Comparative Anatomy; in Greek, Latin, and English, as well as in the Teutonic, Romance, Sanskrit, and Semitic languages. History, Political Economy, Logic, Ethics and the History of Philosophy have also been taught. The resident staff has received the coöperation of non-resident professors who have from time to time given courses of lectures supplementary to those which are given throughout the year. In the selection of permanent and temporary teachers the effort has been made to secure the services of such as are acknowledged to be leaders by those who are of authority in the same departments of study. Some have already won renown; others, who are younger, have given indications of unusual promise; most are excellent teachers as well as independent investigators; the appointments have never been made because of local, ecclesiastical, or personal ties; and every one has been encouraged to render the best and highest services of which he was capable. As it is not easy to give in general phrases a just idea of the instructions which have been in progress, a tabular view of subjects, teachers and hours will be printed in the appendix to which those who are interested in such details may readily refer, if they desire to

see how far the expectations which were awakened three years ago have been fulfilled. The only guarantee of efficient work in any university or college is to be found in the character, attainments, and experience of the academic staff. Excellent teachers are sometimes fettered or embarrassed by unfortunate conditions, such as the over-pressure of engagements or the inadequacy of instruments, but here, every chief instructor has been free to follow those plans which seemed to him best adapted to his theme and to his pupils; no one has been burdened by too many or too onerous appointments; and the requisite apparatus, both literary and scientific, has been liberally provided. Lectures, recitations, personal conferences, formal examinations, laboratory practice and field observations have all been employed. Thus far there has been no occasion to offer prizes or to mark the comparative standing of different scholars. The classes have for the most part been small, and it has been easy to adapt the method of teaching to the needs of individuals. Enthusiastic and steady devotion to study, encouraging in a high degree to the teachers, has been characteristic of the classes. Courses of summer reading have been marked out for those who desired them and have been made the subject of subsequent examinations. Associations in which the professors and the more advanced scholars have alike

taken part have been steadily maintained; and in Mathematics, Greek, and History, some of the methods of the German seminaries have been successfully introduced.

Throughout all the departments a spirit of earnest work, of order, and of good will has been manifested, making us in fact, as well as in name, a College,—*SOCIETAS MAGISTRORUM ET DISCIPULORUM*.

Graduate Students. The reputation of an able staff has attracted a number of advanced students sufficiently large to make it clear (as many counsellors predicted at the beginning of our work), that educated young Americans are ready to accept the opportunities here offered to them. There have been connected with this institution during the last three years, 127 graduate students, 51 of whom have held Fellowships. They came from the following States:

Maine, 1	Mississippi, 1
Vermont, 2	Louisiana, 1
Massachusetts, . . 10	Ohio, 3
Connecticut, . . . 2	Michigan, 1
New York, 12	Indiana, 2
New Jersey, 7	Illinois, 3
Pennsylvania, . . . 6	Wisconsin, 1
Maryland, 53	Iowa, 3
[Baltimore, 44.]	Missouri, 1
District of Columbia, . 2	Kansas, 1
Virginia, 6	California, 2
North Carolina, . . . 2	Russia, 1
South Carolina, . . . 2	Japan, 1
Georgia, 1	

The Institutions from which they had received degrees were 57 in number,—namely:

Amherst College,	6	Marietta College,	1
Bellevue Hospital Medical School, (N. Y.),	2	Maryland Agricultural College,	1
Bonn, University of,	1	Maryland, University of,	23
Bowdoin College,	2	Mass. Inst. of Technology,	2
Brown University,	1	Mercer University,	1
California, University of,	2	Michigan, University of,	3
Charleston College, (S. C.),	1	Muhlenberg College,	1
Cincinnati, University of,	1	Pennsylvania, University of,	2
Columbia College,	2	Physicians and Surgeons, College of, (Balt.),	1
Columbian University,	1	Princeton College,	6
Concordia College,	2	Pritchett Institute, (Mo.),	1
Cornell University,	6	Randolph-Macon College,	1
Dartmouth College,	1	Rensselaer Polytechnic Institute,	1
Davidson College,	2	Rochester, University of,	1
Dickinson College,	1	Rutgers College,	2
Dickson Seminary,	1	South Carolina, University of,	1
Drew Theological Seminary,	1	St. John's College,	2
Furman University, (S. C.),	1	Stevens Inst. of Technology,	2
Georgetown College, (D. C.),	2	Syracuse University,	1
Göttingen, University of,	5	Tokio, University of, (Japan),	1
Hampden-Sidney College,	1	Virginia, University of,	9
Harvard University,	6	Washington College, (Md.),	1
Haverford College,	3	Washington University, (Balt.),	2
Heidelberg, University of,	1	Washington and Lee University,	2
Iowa Agricultural College,	1	Wesleyan University,	3
Iowa College,	1	Western Maryland College,	2
Lafayette College,	3	Williams College,	4
Lehigh University,	1	Yale College,	8
Leipsic, University of,	3		

Fellows. Among the graduates the corps of Fellows holds an important place. They are selected by the Faculty and appointed by the Trustees, and are the recipients of an honorary stipend sufficiently large to pay their necessary expenses,—so that they may devote their time exclusively to study. They constitute in fact,

though not in name, a class of young men in training for professorships,—a teacher's class of the highest grade. The importance of this feature in our organization is so great as to call for special consideration here.

The system of Fellowships was instituted for the purpose of affording to young men of talent from any place, an opportunity to continue their studies in the Johns Hopkins University, while looking forward to positions as professors, teachers, and investigators, or to other literary and scientific vocations. The appointments have not been made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the Fellowships are not so much honors and prizes bestowed for past achievements, as helps to further progress, and stepping-stones to honorable intellectual careers. They have not been offered to those who are definitely looking forward to the practice of either of the three learned professions,—(though such persons have not been formally excluded from the competition,) but have been bestowed almost exclusively on young men desirous of becoming teachers of science and literature, or determined to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician, and the minister.

Every candidate is expected to submit his college diploma or other certificate of proficiency from the institution where he has been taught, with recommendations from those who are qualified to speak of his character and knowledge. But this is only introductory. He must also submit, orally or in writing, such evidence of his past success in study, and of his plans for the future, together with such examples of his literary or scientific work, as will enable the Faculty to judge of his fitness for the post. The examination is indeed in a certain sense competitive; but not with uniform tests, nor by formal questions and answers submitted to the candidates. First the head of a given department considers, with such counsel as he may command, the applicant's record. The professors as a body then deliberate on the nominations made by individual members of their body. The list upon which they agree, with the reasons for it, is finally submitted by the President of the University to the Executive Committee, and by them to the Trustees for final registration and appointment. By all these precautions, the very highest results which could be anticipated have been secured. A company of most promising students has been brought together, and their ability as teachers and scholars has been recognized by the calls they have received to permanent and attractive posts in different parts of the country.

The number of individuals who had been appointed to Fellowships prior to September 1, 1879, was 51; of these 13 began their career in this University as Graduate Students.

The departments of Study of those appointed, were as follows: Mathematics, 6; Physics, 6; Chemistry, 8; Biology, 10; Greek, 8; Comparative Philology, 3; History and Political Science, 3; Philosophy, including Aesthetics, 4; Engineering, 2; Mineralogy, 1.

The present incumbents of Fellowships are 20 in number. Of the 31 others appointed, 16 are now Instructors in Colleges and Universities, (8 here, and 8 elsewhere); 2 are engaged as Teachers in Classical Schools; 2 are attached to the United States Coast Survey, and one to the United States Fish Commission; one is attached to the Metropolitan Museum of Art, in New York City; 4 others are engaged in the practice of professions, other than teaching, (1 Chemist; 1 Civil Engineer; 1 Physician; 1 Lawyer); 4 are still pursuing their studies here or abroad; and one died without entering upon his Fellowship.

The Institutions at which those appointed as Fellows had graduated or received the Baccalaureate degree, were:

Amherst College,	4	Columbian University,	1
Bowdoin College,	2	Concordia College,	2
California, University of, . .	1	Cornell University,	4
Columbia College,	1	Furman University, (S. C.), .	1

Harvard University,	8	Rensselaer Polytechnic Inst.,	1
Haverford College,	1	Rutgers College,	1
Iowa College,	1	South Carolina, University of,	1
Lafayette College,	2	Stevens Inst. of Technology,	2
Marietta College,	1	Tokio, University of, (Japan,)	1
Mass. Inst. of Technology,	1	Virginia, University of,	5
Michigan, University of,	1	Wesleyan University,	1
Princeton College,	3	Williams College,	2
Randolph-Macon College,	1	Yale College,	6

The Institutions from which the degree of Doctor or Master had been received by the holders of Fellowships were:

Amherst College,	2	Lafayette College,	1
Columbia College,	1	Leipsic, University of,	2
Davidson College,	1	Marietta College,	1
Göttingen, University of,	4	Michigan, University of,	1
Harvard University,	2	Pennsylvania, University of,	1
Heidelberg, University of,	1	Virginia, University of,	1
Iowa College,	1	Yale College,	2

Collegiate Students. In addition to graduates, collegiate students have been received. The number of such who have been enrolled here during the past three years is 91—and almost all of them have come from Baltimore and its vicinity. In order to become “matriculates,” or members in full of the university, a rigid examination in Latin, Greek and Mathematics must be passed,—except that scientific students may offer French and German instead of Greek. A good English education with some knowledge of natural science is also expected. Students who are not ready to matriculate in all branches, have been conditionally

received as "candidates" for matriculation, with the understanding that they should quickly comply with all requisitions; and a few who do not propose to become candidates for degrees, have in exceptional cases been admitted as "special students." The policy has been at the outset to invite scholars,—but at the same time to uphold the standard of the best preparatory schools. This is accomplished by prescribing and maintaining a matriculation grade, which is certainly quite as high as American colleges can now insist upon.

After matriculation, the student may follow any one of seven courses which are antecedent to the Baccalaureate degree. These courses are all of them so arranged as to secure a liberal and not a special education; they are supposed to be equally difficult and equally honorable; in them all strict examinations are held, and promotion is only secured by a full compliance with the University requirements. One of these courses provides a thorough classical training; another is chiefly mathematical; a third is based on chemistry and physics; in a fourth, biological sciences predominate; in a fifth, philosophical studies have full recognition; historical and political subjects make the principal themes in the sixth; and in the seventh, modern languages and literature take the place of Latin and Greek. Besides the dominant

or major subjects, minor topics receive attention. By this combination a young man may secure a broad foundation for subsequent work without anticipating his proper professional studies,—and he may, if he chooses, select that course which will tend toward his chosen calling; for example, the biological course is arranged as an introduction to the school of medicine; the course in historical and political science, to the school of law; a different plan of study may lead to the school of theology; and the other courses allow an election between ancient and modern languages, and between the mathematical, physical and chemical sciences.

2. Collections of literary and scientific apparatus. The Hopkins foundation was preceded by that of the Peabody Institute, already referred to, which has collected an excellent library of over 67,000 volumes, (besides 10,000 pamphlets,) and is constantly increasing. Within the past year, the work of enlarging the Peabody building has been finished, and the accommodations for reading and study have been much improved. It is more and more resorted to by the professors and the scholars of our University, who are in the position to appreciate heartily all that is done by the Provost, the Librarian and the Trustees to make the library a convenient and attractive place for investigation and research. Within its walls some of our com-

pany have spent a large part of their time during the past year.

It would seem as if Mr. Peabody, or his advisers foresaw the day when a company of scholars would be gathered around his foundation. His letter of February 12, 1857, provides—

“For an extensive Library, to be well furnished in every department of knowledge, and of the most approved literature, which is to be maintained for the free use of all persons who may desire to consult it, and be supplied with every proper convenience for daily reference and study, within appointed hours of the week-days of every year. It should consist of the best works on every subject embraced within the scope of its plan, and as completely adapted, as the means at your command may allow, to satisfy the researches of students who may be engaged in the pursuit of knowledge not ordinarily attainable in the private libraries of the country. It should be guarded and preserved from abuse, and rendered efficient for the purposes I contemplate in its establishment, by such regulations as the judgment and experience of the Trustees may adopt or approve. I recommend, in reference to such regulations, that it shall not be constructed upon the plan of a circulating library; and that the books shall not be allowed to be taken out of the building, except in very special cases, and in accordance with rules adapted to them as exceptional privileges.”

In the spirit of this foundation, the Trustees of the Peabody and Hopkins gifts early exchanged letters of coöperation in respect to “all that could advance the cause of education, refinement and culture in our city and State.” The Provost of the Peabody, Dr. N. H. Morison, referring, in 1876, to the purchase of Crelle's *Journal für Mathematik*, and other books suggested by Prof. Newcomb, which were likely to be “of great advantage to the students and professors of the higher mathematics about to assemble in Baltimore,” proceeded in

these cordial words to speak of the policy of the Peabody library :

" It is proper to say that our library will be tested as never before by the body of learned men, and of students under their direction, which will be called to this city by the establishment of the Johns Hopkins University. I feel that we ought to meet their wants in the purchase of books, so far as it can be done without injury to a library which is not a technical one, but which was founded for the use of the general public. In their researches, every facility should be granted to them which is consistent with the security of the books, and their proper order and arrangement."

Without this aid from the Peabody foundation, our organization would have been very much delayed, and indeed our funds would have been seriously curtailed ; for,—while there is no agency, except the living teacher, so important to a University as a large collection of books, freely accessible to those who know how to use them,—a good library is costly to purchase and costly to maintain, and is moreover of slow growth. We have, therefore, reason to be constantly grateful that the Peabody foundation so long preceded the Hopkins.

Those of our staff who are engaged in historical studies are also under great obligations to the Maryland Historical Society and its Librarian, Mr. J. W. M. Lee, who has freely opened the rich historical stores of that society to our use. The rooms of the Society have been for three years granted to us for a Historical Seminary, the members of which have greatly profited by the free access they have enjoyed to the printed sources of American history.

It is indispensable that the professors of a university who are engaged in investigation and publication, should be able to bring to their ordinary studies and laboratories certain books which are commonly bought by public libraries rather than by individuals; such for example as the publications of learned societies, the scientific works issued by governmental aid, collections of inscriptions and texts, zoölogical and other scientific plates, and books privately printed or issued in small editions. In many cases it is not enough to be allowed to consult these books in a public room;—they are of use only when studied with other appropriate aids. Such books are usually procured at a very large outlay, are of interest to but few persons, are rarely called for, and consequently remain on the library shelves untouched from one year's end to the other. There is a growing disposition among librarians to facilitate the use of such books under regulations which will prevent injury and loss. In Germany it is so common a usage, as to be almost a rule, that the professors of any university may draw books from the library of any other.

So, in this country, the generous mode in which most of the large libraries are conducted, enables scholars to draw from time to time upon distant collections. It is generally acknowledged by librarians of the school of Justin Winsor, that books are most useful when they are best used; and that

libraries are not so much store-houses, to meet remote contingencies of future wants, as laboratories furnished with the best instruments now required for study. Among the distant libraries to which some of our teachers have been indebted for the loan of books, under special circumstances, are these:

The Smithsonian Institution.

The Library of Congress.

The Library of the Army Medical Museum.

The Library of the Massachusetts Historical Society.

The Royal Library of Munich.

The Library of Harvard College.

The Museum of Comparative Anatomy, Cambridge.

It is under these circumstances that our own library becomes the place for frequent consultation and for daily work. It has four departments—

- (a) a general reference collection of books, including not only cyclopædias and dictionaries, but copies of the works of great authors, ancient and modern, in different branches of literature and science:
- (b) several special collections of books which have been bought as the working apparatus of those departments of study now instituted among us, from lists which have been furnished by the several instructors:
- (c) a transient collection of *new* books, English, French and German, brought here for examination as soon as published, sometimes by

purchase, and sometimes by the courtesy of dealers :

- (d) a very full collection of current periodical literature, so selected as to supplement the lists of the Peabody, the Mercantile Library, and other reading rooms of Baltimore. A printed list of these journals, published in December, 1878, includes 579 periodicals, 251 of which are taken by the University.

Our reading room is open from 9 a. m. to 10 p. m., and is quiet and attractive. The authorities have acted in the spirit of Panizzi, who said that it was his desire to make the reading room of the British Museum so complete and so convenient that no private library, however rich the owner, would surpass it in adaptation to reference and study.

The number of books belonging to the University at this time is 7,084 bound volumes. The cost of books and periodicals, including binding, freight, &c., has been \$22,031.18.

The scientific laboratories of the University are three in number. They are open throughout the day, and are fully equipped. Chemistry has a special building, constructed in 1876-7, and well arranged for about forty workers. It contains conveniences for all kinds of chemical work, separate rooms being provided for different special branches. It has a well selected library, intended

for the use of those working in the laboratory. The physical rooms are less convenient, and are indeed inadequate to the work performed in them; but they are furnished with apparatus purchased of the best European and American makers, and selected with special reference to investigations, and still more specially for researches in respect to electricity, magnetism, and heat. In these particulars, few institutions, if any, are better supplied. A list of the instruments available here and elsewhere for precise physical experiments, has lately been printed by Harvard College. The biological laboratory has a large suite of rooms occupying the entire upper story of our building, and including a general laboratory, several private work-rooms, a lecture-room and a cabinet. This also is well supplied with new and appropriate instruments. A skilful mechanic is in the constant employ of the University for the construction and repair of apparatus. The amount expended for scientific apparatus has been \$27,761.00.

In the building up of collections, mineralogical, geological, botanical, zoölogical, and ethnological, the University has scarcely made a beginning. The proximity of Baltimore to Washington makes it easy for our workers to visit the collections of the capital, those of the Smithsonian Institution being particularly attractive. There is reason also

to hope that a special contribution for a museum of natural history will be made in Baltimore by some individual or by some association, so that the funds of this University may always be free from such a charge and reserved for instruction.

3. *Investigation and Publication.* The experience of the last three years has justified the position which was taken at the outset of the university, that opportunity should be afforded for all who are so disposed to engage in investigations in their several departments, and that they should be encouraged to publish the results at which they arrive. It was believed that learning and teaching, inquiry and instruction should never be separated. There has been no "endowment of research," no separation of the work of the investigator from that of the teacher, no attempt to enforce the consideration of scientific or literary themes, no striving after sensational effects; but simply this, a recognition of the responsibility of the teacher to be the leader of his scholars, to show them by his own methods of work how they may work, to suggest good subjects of study and to apply to their elucidation the most skilful agencies. Accordingly, as stated already, the professors have not been too much confined by appointed duties in the class rooms; and on the other hand not one of them has been freed from positive and regular appointments as a teacher.

In the appendix some indication is given of the results of this policy.

When the time for publication came, it was found that there were no journals in this country in which extended mathematical, physiological, chemical and philological papers could be promptly published, and the trustees were therefore led to encourage the establishment of journals, the pages of which are open not only to papers from members of this university but to other contributors.

The first of these serials was the *American Journal of Mathematics*, of which Professor Sylvester is the editor in chief, and Dr. Story the editor in charge. The coöperation of eminent mathematicians, European as well as American, was enlisted. A quarto page was adopted, and four numbers, (making a volume of about 384 pages), were promised annually. The first volume is now completed containing forty-nine communications, eleven of which were the contributions of the chief editor and seven came from other members of this University—W. E. Story, H. A. Rowland, T. Craig, G. B. Halsted, and F. Franklin. The American contributors were S. Newcomb, C. S. Peirce, J. W. Mallet, H. T. Eddy, G. W. Hill, A. W. Phillips, and others; papers were also received from A. Cayley, W. K. Clifford, and E. Frankland of England, E. Lucas of Paris, R. Lipschitz, and G. Weichhold of Germany.

The work of the Johns Hopkins Chemical Laboratory was at first reported in a series of "Chemical Notes;" twelve of which were printed. This mode of printing has been given up and in its place the American Journal of Chemistry has been begun under the editorial supervision of Professor Ira Remsen. This is printed in octavo form; six numbers a year are promised,—three of which have already appeared,—and original contributions have been received from the laboratories of Cambridge, New Haven, Cincinnati, the University of Virginia, etc.

The papers of the Biological department of this University have been communicated to journals published elsewhere, and especially to the Journal of Physiology, published in London and Cambridge, of which Professor M. Foster is one of the editors and Professor Martin an associate editor. Five papers by H. N. Martin, W. K. Brooks, I. E. Atkinson, W. D. Booker, and H. Sewall have been collected and republished under the title "Studies from the Biological Laboratory, Session of 1877-78." The scientific results of the Chesapeake Zoölogical Laboratory, in the summer of 1878, have been published in an octavo volume of 170 pages, (with several plates)—the expenses of printing being defrayed by Messrs. S. M. Shoemaker, Enoch Pratt, J. W. Garrett, J. W. McCoy, H. N. Martin, D. C. Gilman, and others.

Professor Gildersleeve has undertaken the editorial charge of a Philological Journal and has issued a prospectus, and the publication will commence in the course of another academic year.

4. *Examinations and degrees.* The examinations in this University are as follows:—1. for admission; 2. for matriculation; 3. for the test of progress, prior to the Baccalaureate degree; 4. for the degree of Master of Arts and Doctor of Philosophy.

The preliminary examination is informal and may be dispensed with if the candidate is ready to matriculate. Its object is to advise the scholar as to his fitness for admission. In order to become a member of the university, in full, the candidate must be matriculated. The progress of the student is tested by semi-annual examinations in which gentlemen who have not instructed the class, as well as its teachers, participate. In the examination for the Doctor's degree, stress is laid upon the thesis, which must indicate mature and well trained abilities, and the candidate is further tested by oral questioning or by written papers proposed by the Faculty.

In 1878, four persons received the Doctor's degree as stated in the last annual report.

On June 12, 1879, the following persons were admitted to the degree of Ph. Dr.:

1. MAURICE BLOOMFIELD, of Illinois, who had received the degree of A. M. from Furman University, in Greenville, S. C., at which place he was pursuing special Oriental studies, under Prof. C. H. Toy, then of the Southern Baptist Theological Seminary. He was examined in Sanskrit, Arabic, Syriac and Hebrew, and submitted a thesis, which is to be published, on the *Noun-Formation of the Rig Veda*. His attainments were certified to, not only by the resident teachers of this university, but also by Professor W. D. Whitney, of Yale College, whose pupil he was in 1877-8.

2. SAMUEL F. CLARKE, of Illinois, whose first degree was received from Yale College, where he had pursued his studies in the Sheffield Scientific School. He has been devoted to biological research, and was examined in animal morphology and embryology, animal physiology and histology, and vegetable morphology. The subjects of his theses were (1) the *Development of Amblystoma*; and (2) a report on a collection of deep sea *Hydroids from the Gulf of Mexico*, submitted to him by Prof. A. Agassiz, of the Museum of Comparative Zoölogy, Cambridge. The second of these papers has been printed in the Bulletin of that Museum for 1879.

3. GEORGE B. HALSTED, of New Jersey, who was graduated in Princeton College in 1876, and is now a tutor of mathematics in that institution. He was examined in mathematics and logic. His thesis, entitled *Basis for a Dual Logic*, was submitted to and approved by Professor Francis Bowen, professor of logic in Harvard College.

4. EDWARD HART, of Pennsylvania, received his early training in Lafayette College, where he received a degree in 1874, and is now assistant professor of chemistry. He was examined in chemistry and physics. His thesis, the result of prolonged work in the chemical laboratory, on *Nitrosulphobenzoic Acids and their Derivatives*, has been printed in the Notes from the Chemical Laboratory, No. 12, and the substance of it will also appear in the American Chemical Journal.

5. WILLIAM W. JACQUES, of Massachusetts, who was graduated in the Massachusetts Institute of Technology, Boston, in 1876. His thesis on the *Distribution of Heat in the Spectra of Various Substances*, has been published by the American Academy of Arts and Sciences. He was examined in physics and chemistry.

6. HENRY SKWALL, of Maryland, was graduated as Bachelor of Science by the Wesleyan University, at Middletown in 1876. He has been engaged in the biological laboratory, and has been examined in animal physiology and histology, and also in animal morphology and vegetable physiology. He submitted a thesis on the *Development and Regeneration of the Gastric Glandular Epithelium during fetal life and after birth*, which has been published in the Journal of Physiology, London, Vol. IV, No. I; and also a paper on the *Physiology of Tetanus*, which is to appear in an early number of the same Journal. In his examination, Dr. H. P. Bowditch, professor of physiology in Harvard College, took part.

On the same date the following persons were admitted to the degree of Bachelor of Arts, viz:

1. **GEORGE W. MCUREARY**, of Baltimore, who was graduated at the City College in 1874, and has successfully completed a course of classical studies, as well as courses in physics, French and German.

2. **A. CHASE PALMER**, of Baltimore, who received his early training under Rev. Dr. Dalrymple, and was afterwards a member of Princeton College. He has pursued a course of classical and historical studies, and the major course in German, and has also, for a year and a half, worked with success in the chemical laboratory.

3. **EDWARD H. SPIEKER**, who finished the course at the City College, in 1877, and has since pursued a course of classical studies, together with French and German, and a course in physics extending through one year.

5. *Public Lectures.* In order to extend the educational influence of the University, courses of Lectures have been opened to the public on certain conditions,—the tickets being gratuitously distributed first to members of the University, then to teachers and special students of the subjects announced, and next to gentlemen and ladies in the order of application. The teachers of the public and private schools have, in large numbers, attended some of these courses. In the following list the subjects, the number of lectures, and the average number of hearers, are given. Many of the names of the lecturers will be recognized as those of professors in other colleges, to whose coöperation this University is greatly indebted. Other courses have been given by the staff of the Johns Hopkins University, including Fellows who have, from time to time, volunteered to lecture upon subjects to which they had given particular

attention. The attendance of students has been voluntary. The lectures have been of an academic and not of a popular character, and yet they are regarded as supplementary and not as essential to the regular courses of instruction. By a residence among us of two or three years, a student, while rigidly pursuing his chosen studies, may have the opportunity of listening to able teachers in different branches of literature and science, on some aspects of their work which are of general interest.

SUMMARY OF THE PRINCIPAL COURSES OF PUBLIC LECTURES, 1876-9, (*not including many annual courses in Chemistry, Physics, Mathematics, Biology, Languages and Literature to which the public are not invited*):

	Average Attendance.
ADAMS, H. B., (Associate.)	
Religion and Government in the Ancient World, (2), . . .	19
Beginnings of Church and State, (10),	88
ALLEN, W. F., (Prof. Univ. of Wisc.)	
History of the Fourteenth Century, (20),	96
BILLINGS, J. S., (U. S. Surg. Genl's Office.)	
History of Medicine, etc., (20),	49
BRANDT, H. C. G., (Associate.)	
German Literature prior to the Classical Period, (9), . . .	42
BROOKS, W. K., (Associate.)	
Theories of Biology, (16),	80
CHILD, F. J., (Prof. Harv. Univ.)	
Chaucer, (20),	191
Ballads of England and Scotland, (20),	187
Shakespeare's Plays: Hamlet, Macbeth, (10),	195
COOLEY, T. M., (Prof. Univ. of Mich.)	
Torts, (20),	87
Recent Amendments to the Constitution of the United States, (6),	103
Evils in Local Government, (6),	87

	Average Attendance.
CROSS, J. M., (Associate.)	
The New Testament, (10),	12
DIMAN, J. L., (Prof. Brown Univ.)	
Thirty Years' War, (20),	192
ELLIOTT, A. M., (Associate.)	
Dante, (10),	152
FARLOW, W. G., (Prof. Harv. Univ.)	
Selected Botanical Subjects, (6),	89
GILDERSLEEVE, B. L., (Professor.)	
Greek Lyric Poetry, (20),	42
Homer's Odyssey, (20),	153
Introductory to Greek Prose Literature, (12),	80
HALSTED, G. B., (Fellow.)	
Clear Thinking and its Best Modern Methods, (5),	61
HASTINGS, C. S., (Associate.)	
Theory of Sound in its Relation to Music, (6),	162
HILGARD, J. E., (U. S. Coast Survey.)	
Territorial Surveys, (20),	21
JAMES, W., (Prof. Harv. Univ.)	
The Senses and the Brain and their Relation to Thought, (10),	62
LOWELL, J. R., (Prof. Harv. Univ.)	
Dante, (20),	179
MALLET, J. W., (Prof. Univ. of Va.)	
Waste Products of Chemical Manufacture, (20),	29
History of the Chief Branches of Chemical Industry, (20),	45
MARTIN, H. N., (Professor.)	
General Biology, (20),	66
MEANS, D. MCG., (Fellow.)	
The Political Situation in Eastern Europe, (4),	70
Political Economy in the United States, (4),	15
MORRIS, G. S., (Prof. Univ. of Mich.)	
General History of Philosophy, (20),	124
Topics, Historical and Practical, in Ethics, (14),	128
MURRAY, T. C., (Associate.)	
The Hebrew Scriptures, (9),	41
NEWCOMB, S., (U. S. N. Observ.)	
History of Astronomy, (20),	50
RABILLON, L., (Resident Lecturer.)	
History of the Formation of the French Language, (19),	20
History and Evolution of the French Language, (20),	48
French Romantic Literature, (11),	35
REMSSEN, I., (Professor.)	
History of Chemistry, (12),	111

	Average Attendance.
ROYCE, J., (Fellow.)	
Studies on the "Return to Kant," (5),	18
Poetry of the German Romantic School, (8),	33
SAVAGE, A. D., (Fellow.)	
Cyprus and Mycenae, (8),	81
SCOTT, A., (Associate.)	
English History, (12),	87
SIEHLER, E. G., (Fellow.)	
History of Greece in the 5th Century, B. C., (10),	39
Attic Life and Society, (8),	30
VON HOLST, H., (Prof. Univ. of Freiburg.)	
The German Empire, (10),	258
WALKER, F. A., (Prof. Yale College.)	
Money, (20),	49
Finance, (21),	44
WHITNEY, W. D., (Prof. Yale College.)	
Historical Development of the Inflective Structure of the Indo-European Languages, (18),	84

Less public in their character are certain courses of lectures which have been given to specialists by the teachers of the University. During the last winter Dr. Martin gave a weekly series of physiological demonstrations to the professors and students of the medical schools of Baltimore, the number of attendants being 25. Dr. Hastings, at the request of gentlemen in Washington devoted to astronomical science, gave four lectures in the Smithsonian Institution, to a company of 15 hearers, on the Mathematical Theory of the Telescope, embodying some original views of his own. Dr. T. Craig lectured to a small company chiefly consisting of civil and military engineers resident in Baltimore, on questions in hydrodynamics.

6. *Teachers' Class in Zoölogy.* Two courses of biological lessons, with laboratory work, designed exclusively for teachers, have been given in successive winters; the first by Professor Martin in 1877-8, on Animal Physiology, and the second in 1878-9 by Dr. Brooks on Elementary Zoölogy. An account of the class first named is given in the University Report for 1878;—an account of the second, by Dr. Brooks, is here inserted.

In conducting the Teachers' Class in Zoölogy, the plan pursued by Dr. Martin with the Teachers' Class in Physiology during the previous winter, was adopted as far as the nature of the subject permitted.

The public announcement of the course stated that "the class would be limited to school teachers or students of a Normal College who are engaged in teaching, or who purpose to teach," and in order to allow time for each student to receive personal help from the instructors, the class was limited to fifteen persons.

The following persons attended the course, all teachers in Baltimore and its vicinity, but not all teaching natural science:

MISS EMMA COWMAN,	DR. C. F. PERCIVAL,	MR. G. L. SMITH,
MR. H. GORDON,	MR. E. H. READE,	MISS M. B. SMYTH,
MISS ISABELLA HAMPSON,	MR. ARTHUR RESLER,	MR. B. SOLLERS,
REV. J. G. MORRIS,	MR. AUG. SCHMIDT,	MR. J. W. WILSON,
MISS I. J. MCNEAL,	MISS SCOTT,	MISS E. A. YARNALL.

The aim of the course was to supply at first hand, by the study of typical forms of animal life, such an acquaintance with the principles of Morphology as would be of use in teaching any branch of natural science, and the furnishing of facts, to be retailed to classes, was made a very subordinate object.

For this reason I did not attempt to restrict the course to animals which could be procured for class work, although common forms were used as far as possible.

The course of instruction included fifteen one-hour lectures and forty-five hours of laboratory work, on the mornings of fifteen Saturdays.

A series of typical forms of animal life was selected, and a descriptive lecture, illustrated by diagrams, black-board drawings and specimens, was given upon each one of them. Each student was then supplied with one or more specimens of the same animal, and with a printed sheet of directions for studying it. This paper enumerated the points to be noticed, in the order in which they are best studied, and gave directions for handling and dissecting the specimens.

Each student was also provided with the necessary dissecting apparatus; with a very simple and effective dissecting microscope designed for the purpose by Dr. Clarke, and with a compound microscope.

The following is a list of the animals which were studied:

Protozoa: Amœba, Vorticella, Paramœcium.

Cœlenterata: Fresh-water Hydra, Calcareous Sponge.

Echinoderms: Star Fish, Sea Urchin.

Annelids: Earth worm, Leech.

Arthropods: Cray Fish, Common Crab, Grasshopper.

Mollusca: Fresh-water Mussel, Oyster, Squid.

It was intended to include four vertebrates, but the above animals occupied the whole fifteen weeks.

Copies of the laboratory directions were sent to other persons engaged in similar teaching. They were used by Prof. Hyatt in the instruction to teachers given by the Boston Society of Natural History. They are used this year by Prof. Faxon in the instruction to under-graduates at the Museum of Comparative Zoölogy of Harvard College, and there have been numerous applications for them from other places.

The assistance given me by Dr. Clarke was of great value, as one person could hardly have superintended the work in the laboratory.

7. *The Chesapeake Zoölogical Laboratory.* This organization, under Dr. Brooks, has held its second session during the summer of 1879—attended by a select company of advanced students of zoölogy. The results of the season will soon be printed in an extended form; meanwhile, the summary given in the appendix may be read with interest. It will be noticed that the Engineer Corps of the U. S. Army, the Smithsonian Institution, the U. S. Fish Commission, and the Maryland Fish Commission, have coöperated in this work with the Johns Hopkins University.

8. *Instruction Preliminary to Medical Studies.* Much attention has been bestowed during the year upon the subject of a course of studies antecedent

to the study of medicine. In addition to the suggestions received from able members of the profession in this country, the Trustees have been favored with written communications from a number of eminent British surgeons, namely:

ROBERT BENTLEY, M. R. C. S., *London*, Dean of the Medical Faculty of Kings College.

G. W. CALLENDER, F. R. S., *London*, Lecturer on Surgery at St. Bartholomew's Hospital.

MICHAEL FOSTER, F. R. S., *Cambridge*, Praelector of Physiology at Trinity College.

CHRISTOPHER HEATH, F. R. C. S., *London*, Professor of Clinical Surgery at University College.

TIMOTHY HOLMES, F. R. C. S., *London*, Lecturer on Surgery at St. George's Hospital.

T. H. HUXLEY, Sec. R. S., *London*, Professor of Natural History at the Royal School of Mines.

SIR JAMES PAGET, Bart., F. R. S., *London*, President of Royal Medical Chirurgical Society.

GEORGE ROLLESTON, F. R. S., *Oxford*, Professor of Anatomy at the University of Oxford.

J. B. SANDERSON, F. R. S., *London*, Professor of Physiology at University College.

W. S. SAVORY, F. R. S., *London*, Lecturer on Surgery at St. Bartholomew's Hospital.

WILLIAM STOKES, F. R. S., *Dublin*, Professor of Physiology at the University of Dublin.

WILLIAM TURNER, F. R. C. S., *Edinburgh*, Professor of Anatomy at the University of Edinburgh.*

The views of these gentlemen were in the main unanimous, (although they were not in consultation with one another), and confirmed the Trustees in respect to the wisdom of the courses projected. The essentials of our scheme, which are explained

*Subsequently, DR. ACLAND, Regius Professor of Medicine in the University of Oxford, visited Baltimore and gave in writing his recommendations, which are about to be printed.

in the Register, include prolonged studies in Physics, Chemistry, and Biology, with ample practice in laboratories. This course can only be followed by those who have matriculated or graduated, or by a special examination have satisfied the authorities that they are sufficiently good scholars to profit by the advantages here offered. The study of English, French, German, Latin, and, if the candidate desires it, Greek, may be prosecuted in connection with scientific work,—and so of other literary subjects.

9. *Personal Changes.* Death has removed from the number of instructors Mr. Thomas C. Murray, an Associate Professor in the department of Semitic languages. He died March 20, 1879, at the age of 29 years, shortly after completing a course of public lectures on the interpretation of the Hebrew Scriptures, which are soon to be published as a memorial of his life and attainments.

Mr. Murray was one of the persons earliest connected with our academic staff. For a considerable time he acted as librarian, and, to the close of his life, was active in promoting the interests of the library. He was an accurate and learned scholar, a diligent and successful teacher, and a man who lived in accordance with the highest ideal of a Christian life.

By the appointment of the Trustees, Mr. Minton Warren, Ph. D., of the University of Strasburg,

and Mr. A. S. Cook, a graduate of Rutgers College, have been made Associates, the former in Latin and the latter in English. Professor G. S. Morris has been chosen Lecturer in the History of Philosophy and in Ethics; Professor C. S. Peirce, in Logic; Professor J. W. Gibbs, in Theoretical Mechanics; and Mr. Sidney Lanier, in English Literature.

The post of Librarian, vacated by the resignation of Mr. Arthur W. Tyler, now in charge of the Public Library at Indianapolis, was temporarily filled by Mr. A. D. Savage. At the beginning of the new academic year, Dr. William Hand Browne, of Baltimore, assumes the position to which he was chosen by the Board of Trustees.

The following summary indicates the number of Students enrolled during the last three years :

	Graduates, including Fellows.	Matricu- lates.	Non-Matricu- lates.	Total.
1876-77,	54	12	23	89
1877-78,	58	24	22	104
1878-79,	63	25	35	123
*1879-80,	67	31	42	140

The following statement shows the number of persons, (in addition to enrolled Students) who have followed special, not public courses, during the past year :

Teachers attending a special class in Zoölogy,	15
Medical Students attending Demonstrations in Animal Physiology, .	25
Medical Students attending a Course in Animal Histology;	12

*At the opening of the fourth year.

Persons attending a Course in Hydrodynamics,	8
Persons attending a Course on the Theory of the Telescope,	15
Persons attending the Chesapeake Zoölogical Laboratory,	10

10. *Public Assemblies.* The twenty-second of February has been observed as the anniversary of the institution, with the following exercises :

- 1876. Addresses by REVERDY JOHNSON, JR., Esq., President C. W. ELIOT, of Harvard, and an Inaugural by the President of the Johns Hopkins University.
- 1877. Addresses by Professors SYLVESTER and GILDERSLEEVE, and the reading of a Poem by Professor JAS. RUSSELL LOWELL.
- 1878. Addresses by Judge GEO. WM. BROWN, Professor REMSEN and President ELIOT, of Harvard College.
- 1879. Address by Hon. A. D. WHITE, President of Cornell University, and an official Statement by Judge GEO. W. DOBBIN, of the Board of Trustees.

The address of President White in 1879 was an elaborate defence and exposition of the importance of university studies in Historical and Political Science. It was printed and widely distributed.

At the close of President White's address, a company of some 230 college graduates, resident in Baltimore, with the Governor of the State, the Mayor of the city, the Trustees of Johns Hopkins University, and a few invited guests, assembled in the smaller Concert Room of the Academy of Music, and partook of a collation, after which short speeches were made by the presiding officer, Hon. S. T. Wallis, LL. D., Provost of the University of Maryland, President White, Professor Von Holst, (the author of a constitutional history of the United States, who had recently completed a course

of lectures in Baltimore,) Professor Sylvester, Charles Marshall, Esq., of the Baltimore Bar, and Rev. Dr. Leeds, of Grace Church.

Degrees were conferred near the close of the academic year, in the presence of the officers and students and their personal friends.

The University has had the pleasure of receiving many visitors within the past three years, including several scientific and literary associations,—the American Philological Association, the American Institute of Mining Engineers, the Medical and Chirurgical Society of Maryland, the Teachers' Association of Baltimore County, and the College delegates of the Y. M. C. Association. Among the visits of individuals received within the past year, it is particularly pleasant to recall that of Dean Stanley, of Westminster, and his friends, who were here at the opening of our academic work in September, 1878.

Several members of the Faculty (B. L. Gilderleeve, C. S. Hastings, H. B. Adams, and D. C. Gilman) united in giving a course of lectures at the McDonogh School, to the pupils of that foundation, during the winter of 1878-9; and Professor Remsen gave a course of four lectures to mechanics and others in the room of the Academy of Sciences,—his subject being Elementary Chemistry. Dr. Martin gave a lecture before the County teacher's association, on Animal Mechanics, as an

example of how to teach Physiology in schools. Before the Medical and Chirurgical Faculty of Maryland, the annual address was given in 1878, by Professor Remsen, on Chemistry in its relations to Medicine, and in 1879, by Professor Martin, on the Physiology of Secretion.

11. *Conclusion.* In closing this record of the work of three years, I am confident that I express the sentiments of both the governing boards, the Trustees and the Faculty, in adding that we have had increasing reason for confidence and hope. The good will extended toward this foundation by the citizens of Baltimore and by its daily press, as well as by the leaders of educational affairs in different parts of this country, has been remarkable. The number of students constantly increases and their quality constantly improves. There has not been an occasion for the Faculty to reprimand or censure a single student. It is understood that devotion to study, and responsibility to duty are absolutely required of all the members of the University, and that those who are not willing or able to conform to this requirement, are expected to withdraw. It has never been my good fortune to live among a more earnest, diligent, and enthusiastic company of young men than those who are here assembled.

An institution like this, established without ecclesiastical or denominational support, is liable to be misunderstood and misinterpreted,—sometimes even by its very best friends. We have not been free from animadversions; but the authorities have preferred to say nothing in recrimination and but little in self-defence.

The character, aim, and influence of the University foundation must be discovered in the conduct and utterances of those who administer its affairs, and by its dominant efforts through a course of years. Fortunate will it be if teachers and pupils are uniformly found on the side of righteousness and truth; if the voice of the University is never heard in the defence of error, falsehood or pretence; and if all who administer its affairs are reverent toward God and faithful toward man. Such an institution, by unfolding the laws of nature, by discovering principles hitherto hidden, by interpreting history, and by strengthening the foundations of intellectual, moral and religious character, will deserve the support of all good men, under whatever ecclesiastical banner they may choose to be enrolled.

Respectfully submitted,

D. C. GILMAN,

President of the Johns Hopkins University.

BALTIMORE, September 1, 1879.

APPENDIX.

A.

Academic Staff.

PRESIDENT.

Appointed
Dec. 30, 1874. DANIEL C. GILMAN.

PROFESSORS.

Jan. 3, 1876. BASIL L. GILDERSLEEVE, *Greek.*
Mar. 5, 1876. J. J. SYLVESTER, . *Mathematics.*
April 17, 1876. IRA REMSEN, . *Chemistry.*
April 17, 1876. HENRY A. ROWLAND, . *Physics.*
Sept. 4, 1876. H. NEWELL MARTIN, . *Biology.*
Sept. 4, 1876. CHARLES D. MORRIS, . *Classics.*

ASSOCIATES.

April 3, 1876. JOHN M. CROSS, . *Greek.*
April 3, 1876. PHILIP R. UHLER, . *Natural History.*
April 17, 1876. AUSTIN SCOTT, . *History.*
June 5, 1876. A. MARSHALL ELLIOTT, *Modern Philology.*
June 5, 1876. THOMAS C. MURRAY, . *Shemitic.* 1879.
Sept. 4, 1876. HERMAN C. G. BRANDT, . *German.*
Sept. 4, 1876. WILLIAM K. BROOKS, . *Biology.*
Sept. 4, 1876. HARMON N. MORSE, . *Chemistry.*
Sept. 4, 1876. ROBERT RIDGWAY, . *Natural History.* 1877.
Sept. 4, 1876. WILLIAM E. STORY, . *Mathematics.*
Sept. 4, 1876. ARTHUR W. TYLER, . *Librarian.* 1878
Oct. 2, 1876. CHARLES S. HASTINGS, . *Physics.*
May 7, 1877. CHARLES R. LANMAN, . *Sanskrit.*
June 3, 1878. HERBERT B. ADAMS, . *History.*
June 12, 1879. ALBERT S. COOK, . *English.*
June 12, 1879. MINTON WARREN, . *Latin.*
July 7, 1879. WILLIAM HAND BROWNE, *Librarian.*

LECTURERS.

Appointed		Courses.
1876.	JOHN S. BILLINGS, . . . <i>Medical History, etc.</i>	One.
1876.	FRANCIS J. CHILD, . . . <i>Early English, etc.</i>	Three.
1876.	THOMAS M. COOLEY, . . . <i>Law.</i>	Three.
1876.	JULIUS E. HILGARD, . . . <i>Geodetic Surveys.</i>	One.
1876.	JAMES RUSSELL LOWELL, . . . <i>Romance Literature.</i>	One.
1876.	JOHN W. MALLET, . . . <i>Technological Chemistry.</i>	Two.
1876.	SIMON NEWCOMB, . . . <i>Astronomy.</i>	One.
1876.	LÉONCE RABILLON, . . . <i>French.</i>	Three.
1876.	FRANCIS A. WALKER, . . . <i>Political Economy.</i>	Two.
1876.	WILLIAM D. WHITNEY, . . . <i>Comparative Philology.</i>	One.
1877.	WILLIAM F. ALLEN, . . . <i>History.</i>	One.
1878.	WILLIAM JAMES, . . . <i>Psychology.</i>	One.
1878.	GEORGE S. MORRIS, . . . <i>Philosophy.</i>	Two.
1878.	J. LEWIS DIMAN, . . . <i>History.</i>	One.
1878.	H. VON HOLST, . . . <i>History.</i>	One.
1878.	WILLIAM G. FARLOW, . . . <i>Botany.</i>	One.
1879.	J. WILLARD GIBBS, . . . <i>Theoretical Mechanics.</i>	
1879.	SIDNEY LANIER, . . . <i>English Literature.</i>	
1879.	CHARLES S. PEIROE, . . . <i>Logic.</i>	

ASSISTANTS.

1876.	HENRY SEWALL, . . .	<i>Biological Laboratory.</i>	1878.
1879.	SAMUEL F. CLARKE, . . .	<i>Biological Laboratory.</i>	
1879.	FABIAN FRANKLIN, . . .	<i>Mathematics.</i>	
1879.	LYMAN B. HALL, . . .	<i>Chemical Laboratory.</i>	
1879.	CHRISTIAN SIHLER, . . .	<i>Biological Laboratory.</i>	

FELLOWS.

1. HENRY CARTER ADAMS (*Political Science, 1876-79*), from Waterloo, Iowa; A. B., Iowa College, 1874, and A. M., 1877; Ph. D., Johns Hopkins, 1878; *Lecturer upon Finance at Cornell University, Ithaca, N. Y., 1879-80.*

History of Taxation in the United States, (Graduating thesis, J. H. U., 1878), published under the title, Zur Geschichte der Besteuerung in den Vereinigten Staaten von Amerika in der Periode von 1789-1816. (Zeitsch. f. d. gesam. Staatswissenschaft, Tübingen, 1879.)

Coöperation. (Am. Soc. Sc. Assoc., 1878.)

Historical Position of Socialism in the Development of Political Economy. (Penn Monthly, 1879.)

2. HERBERT BAXTER ADAMS (*History, 1876-78*), from Amherst, Mass.; Phillips Academy, Exeter, N. H., 1868; A. B., Amherst, 1872; Instructor at Williston Seminary, Easthampton, Mass., 1872-73; Student of History and Political Science at

Heidelberg, and Berlin, 1873-76; Ph. D., Heidelberg, 1876; Lecturer on History at Smith College, Northampton, Mass., 1878-80; *Associate in History, 1878-80.*

Maryland's Influence in Founding a National Commonwealth, or the History of the Accession of Public Lands by the Old Confederation. (*Maryland Historical Society, 1877.*)

3. WILLIAM KEITH BROOKS (*Biology, 1876*), from Cleveland, Ohio; A. B., Williams, 1870; Ph. D., Harvard, 1874; Assistant, Boston Society of Natural History, 1874-75; *Associate in Biology, 1876-80.*

On an Organ of Sense in the Lamellibranchiate Genus Yoldia. (*Proc. Amer. Assoc., 1874.*)

Embryology of the Fresh-Water Mussel. (*Proc. Amer. Assoc., 1875.*)

Embryology of Salpa. (*Proc. Boston Soc. Nat. Hist., 1875.*)

The Affinity of the Mollusca and the Molluscoida. (*Proc. Boston Soc. Nat. Hist., 1876.*)

The Development of Salpa. (*Bull., Mus. Comp. Zool., Cambridge, No. 14.*)

A Remarkable Life-History. (*Amer. Nat., Nov., 1876.*)

A Provisional Hypothesis of Pangenesis. (*Amer. Nat., March, 1877.*)

Parthenogenesis in Vertebrates and Molluscs. (*Amer. Nat., Oct., 1877.*)

Preliminary Observations upon the Development of the Marine Prosobranchiate Gastropods. (*Studies from the Biol. Lab., J. H. U., 1879.*)

The Development of Lingula and the Systematic Position of the Branchiopoda. (*Scientific Results, Chesapeake Zool. Lab., 1879.*)

The Larval Stages of Squilla empusa. (*Scientific Results, Chesapeake Zool. Lab., 1879.*)

4. THOMAS CRAIG (*Mathematics, 1876-78; Physics, 1878-79*), from Pittston, Pa.; C. E., Lafayette, 1875; Ph. D., Johns Hopkins, 1878; *Tidal Division, U. S. Coast and Geodetic Survey, 1879-80.*

Representation of one Surface upon another, and on some points in the Theory of the Curvature of Surfaces. (*Graduating Thesis, J. H. U., 1878.*)

Motion of a Point upon the Surface of an Ellipsoid. (*Am. Jour. of Math., 1878.*)

Mathematical Theory of Fluid Motion. (*Van Nostrand's Eng. Mag., 1879.*)

Motion of a Solid in a Fluid. (*Am. Jour. of Math., 1879.*)

General Differential Equation for Developable Surfaces. (*Jour. of Franklin Inst., 1879.*)

Treatise on the Mathematical Theory of Projections. (*U. S. Coast Survey, 1879.*)

Projection of the General Locus of Space of Four Dimensions into Space of Three Dimensions. (*Am. Jour. of Math., 1879.*)

Motion of an Ellipsoid in a Fluid. (*Am. Jour. of Math., 1879.*)

5. JOSHUA WALKER GORE (*Mathematics, 1876-78*), from Frederick County, Virginia; C. E., University of Virginia, 1875; *Professor of Natural Science, Southwestern Baptist University, Jackson, Tenn., 1878-80.*

6. GEORGE BRUCE HALSTED (*Mathematics, 1876-78*), from New York City; A. B., Princeton, 1875, and A. M., 1878; Fellow of Princeton College, and Student at School of Mines, Columbia College, 1875-76; Student at Berlin, 1877; Ph. D., Johns Hopkins, 1879; *Tutor in Princeton College, 1878-80.*

Basis for a Dual Logic. (*Graduating Thesis, J. H. U., 1879.*)

Spencer's Classification of the Abstract Sciences. (*Popul. Sc. Mon., 1877.*)

The New Ideas about Space. (*Popul. Sc. Mon., 1877.*)

Bibliography of Hyper-Space and Non-Euclidean Geometry. (*Am. Jour. of Math., 1878-79.*)

Note on the First English Euclid. (*Am. Jour. of Math., 1879.*)

Historical Sketch of Exact Rectilinear Motion. (*Van Nostrand's Eng. Mag., 1878.*)

Mechanical Conversion of Motion. (*Van Nostrand's Eng. Mag., 1878; reprinted in "World of Science," London.*)

Jevons's Criticism of Boole's Logic. (*Mind, 1878.*)

Boole's Logical Method. (*Jour. of Spec. Philos., 1878.*)

Statement and Reduction of Syllogism. (*Jour. of Spec. Philos., 1878.*)

Algorithmic Division in Logic. (*Jour. of Spec. Philos., 1879.*)

7. **EDWARD HART** (*Chemistry, 1876-78*), from Doylestown, Pa.; S. B., Lafayette, 1874; Ph. D., Johns Hopkins, 1879; *Assistant Professor in Chemistry, Lafayette College, 1878-80.*

Nitrosulphobenzoic Acids and their Derivatives. (*Graduating thesis, J. H. U., 1879; notes from Chem. Lab., J. H. U., 1878.*)

Volumetric Estimation of Sulphuric Acid. (*American Chemist, VI, 284.*)

Volumetric Estimation of Iron. (*Chem. News, XXIV, p. 65.*)

Ueber Isomere Sulfosäuren aus Paranitrotoluene. (*Ber. d. Deut. Chem. Ges., X, 1046; notes from Chem. Lab., J. H. U., 1877.*)

Handbook of Volumetric Analysis. (*N. Y. Wiley, 1878.*)

Stopcock of Easy Construction. (*Am. Chem. Jour., 1879.*)

8. **DANIEL WEBSTER HERING** (*Engineering, 1876-78*), from Mechanicstown, Md.; Ph. B., Yale, 1872; Assistant Engineer, Berks County Railroad, Pa., 1873-74; C. E., Yale, 1878; *Assistant Engineer, Baltimore and Cumberland Valley Railroad, Waynesboro', Pa., 1878-80.*

9. **MALVERN WELLS ILES** (*Chemistry, 1876-78*), from Davenport, Iowa; Ph. B., Columbia, 1875, and Ph. D., 1876; *Chemist, Leadville, Colorado.*

A New Qualitative Reaction for Boracic Acid. (*Am. Chemist, 1876.*)

On the Action of Ozone upon Milk. (*Sc. Amer., 1877.*)

On the Oxidation of Sulpho-Acids derived from Metaxylene. (*Notes from Chem. Lab., J. H. U., 1877.*)

On the Oxidation of Xylenesulphonic Acids. (*Notes from Chem. Lab., J. H. U., 1877-78.*)

A New Method for the Quantitative Estimation of Sulphur. (*Notes from Chem. Lab., 1878.*)

10. **WILLIAM WHITE JACQUES** (*Physics, 1876-79*), from Newburyport, Mass.; S. B., Mass. Institute of Technology, 1876; Ph. D., Johns Hopkins, 1879; *Fellow by Courtesy and Resident Student, 1879-80.*

Light Transmitted by One or More Plates of Glass. (*Am. Acad., 1875.*)

Answer to M. Jamin's Objections to Ampère's Theory. (*Am. Acad., 1875.*)

Diffraction of Sound. (*Am. Acad., 1876.*)

An Experimental Proof of the Law of Inverse Squares for Sound. (*Am. Acad., 1876.*)

Effect of the Motion of Air within an Auditorium upon its Acoustic Qualities. (*Jour. Franklin Inst., 1878.*)

Velocity of Very Loud Sounds. (*Am. Jour. of Science, 1879.*)

Diamagnetic Constants of Bismuth and Calc Spar Crystals in Absolute Measure. (*Am. Jour. of Science, 1879.*)

Distribution of Heat in the Spectra of Various Sources of Radiation. (*Graduating thesis, J. H. U., 1879; Am. Acad., 1879.*)

11. **CHARLES ROCKWELL LANMAN** (*Sanskrit, 1876-77*), from Norwich, Conn.; A. B., Yale, 1871, and Ph. D., 1873; Student at Berlin, 1873-74; Tübingen, 1874-75; Leipzig, 1875-76; Secretary and Curator of the American Philological Association, 1879-80; *Associate for Sanskrit, 1877-80.*

Contributions to Grassmann's Wörterbuch zum Rig-Veda. (*Leipzig, 1875-75.*)

Compendium of Sanskrit Paradigms. (1876.)

A Conjectural Emendation of Rig-Veda i. 30. 11. (*Am. Or. Soc. Proc., 1877.*)

On Tentative Linguistic Forms. (*Am. Or. Soc. Proc., 1878.*)

Noun-Inflection in the Veda. (*Am. Or. Soc. Jour., Vol. X, pp. 325-616.*)

12. **DAVID MCGREGOR MEANS** (*Political Science, 1876-77*), from Andover, Mass.; A. B., Yale, 1868; *Professor of Political and Mental Science in Middlebury College, Vermont.*

13. HARMON NORTHRUP MORSE (*Chemistry*, 1876), from Cambridge, Vt.; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Instructor in Chemistry in Amherst College, 1875-76; *Associate in Chemistry*, 1876-80.

Benzoylamidophenols. (*Ber. d. Deut. Chem. Ges.*, 1874.)

Ueber Einige Derivate des Ortho- und Paramidophenols. (*Inaug. Dissertation*, Göttingen, 1875.)

On the Oxidation of Bromethyltoluene and of Similar Substitution Products. (*Notes from Chem. Lab.*, J. H. U., 1877.)

On Acetylamidophenols by Reduction of Ortho- and Paranitrophenols by means of Glacial Acetic Acid and Tin. (*Notes from Chem. Lab.*, J. H. U., 1877.)

14. WALTER HINES PAGE (*Greek*, 1876-78), from Cary, N. C.; Randolph-Macon, Va., 1876; Assistant Professor of Greek and English in Randolph-Macon College, 1875-76; Lecturer to the N. C. Normal College, 1878; Professor in Louisville (Ky.) Male High School, 1878-79; *Cary, N. C.*

15. P. PORTER POINIER (*Physics*, 1876), from Newark, N. J.; M. E., Stevens Inst., 1874. *Died, without entering upon the Fellowship, June, 1876, aged 23 years.*

Formule for the Apparent Specific Heat of Saturated Vapors. (*Jour. Frank. Inst.*, 1875.)

16. ERASMUS DARWIN PRESTON (*Engineering*, 1876-78), from Spruce Grove, Pa.; B. C. E., Cornell, 1875; Assistant Engineer Cornell University Hydraulic Works, 1875; Instructor in Cornell University, 1875-76; *Aid, United States Coast Survey*, 1878-80.

17. HENRY JOSEPH RICE (*Biology*, 1876-78), from Cazenovia, N. Y.; S. B., Cornell, 1876; *Assistant, U. S. Fish Commission*, 1879.

Observations upon the Hatching, Variation, and Development of the Raritan River Smelt, *Osmerus eperlanus*. (*Md. Fish Commission*, 1878.)

Notes upon the Development of the Shad, *Alosa sapidissima*. (*Md. Fish Commission*, 1878.)

18. JOSIAH ROYCE (*Philosophy*, 1876-78), from Oakland, Cal.; A. B., Univ. of California, 1875; Ph. D., Johns Hopkins, 1878; *Assistant Professor of Literature in the University of California, Berkeley, Cal.*

Interdependence of the Principles of Human Knowledge. (*Graduating thesis*, J. H. U., 1878.)

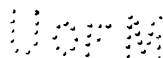
19. ERNEST GOTTLIEB SIHLER (*Greek*, 1876-79), from Fort Wayne, Ind.; Concordia College [German Gymnasium, Fort Wayne], 1869; Student of Classic Philology at Berlin and Leipzig, 1872-75; Ph. D., Johns Hopkins, 1878; *Classical Instructor in Dr. J. Sachs' Collegiate Institute, New York City*, 1879-80.

Plato's Use of Metaphor and Comparison. (*Graduating thesis*, J. H. U., 1878.)

Herodotus, Æschylus and the Battle of Salamis. (*Am. Philol. Assoc.*, 1877.)

The Rhetorical and Critical Labors of Dionysius of Halicarnassus. (*Am. Philol. Assoc.*, 1879.)

20. FREDERICK BOYD VAN VORST (*Ethics and Metaphysics*, 1876-77), from New York City; A. B., Princeton, 1875; Fellow



in Metaphysics in Princeton College, 1875-76; *Attorney-at-Law, New York City.*

21. JOHN HENRY WHEELER (*Philology, 1876-77*), from Auburn, Mass.; A. B., Harvard, 1871, and A. M., 1875; Fellow in Classics of Harvard College, 1877; Student at Leipsic, and Bonn, 1877-78; Ph. D., Bonn, 1879.

De Alcestidis et Hippolyti Euripidearum Interpolationibus. (*Doctor's dissertation, printed at Bonn, 1879.*)

22. SAMUEL FESSENDEN CLARKE (*Biology, 1876-79*), from Geneva, Ill.; Assistant Zoölogist U. S. Fish Commission, 1874-75; Assistant in Zoölogy in Sheffield Scientific School, 1874-76; Ph. B., Yale, 1878; Ph. D., Johns Hopkins, 1879; *Assistant in Biological Laboratory, 1879-80.*

New and Rare Species of Hydroids from the New England Coast. (*Conn. Acad., 1875.*)

New Hydroids of the Pacific Coast of the U. S., South of Vancouver Island. (*Conn. Acad., 1876.*)

Hydroids of Alaska. (*Acad. Nat. Sc., Phila., 1878; Smithsonian Institution, 1878.*)

Hydroids of the Gulf Stream and Gulf of Mexico. (*Mus. Comp. Zool., Camb., Mass., 1879.*)

Development of Amblystoma punctatum, Baird. (*Biol. Lab., J. H. U., 1879.*)

23. LYMAN BEECHER HALL (*Chemistry, 1877-79*), from New Bedford, Mass.; Phillips Academy, Andover, Mass., 1869; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; *Assistant in Chemical Laboratory, 1879-80.*

Ueber Orthonitrosalleysäure und einige Abkömmlinge derselben. (*Inaugural Dissertation, Göttingen, 1875.*)

On the Oxidation of Mesitylene-Sulphonic Acid. (*Notes from Chem. Lab., J. H. U., 1877; Ber. d. Deut. Chem. Ges., X.*)

On the Oxidation of Substitution Products of Mesitylene. (*Notes from Chem. Lab., J. H. U., 1878.*)

Ueber Oxidationsprodukte aus Cymosulfamid. (*Ber. d. Deut. Chem. Ges., XII.*)

24. ALEXANDER DUNCAN SAVAGE (*Greek, 1876-79*), from Pass Christian, Miss.; B. Litt., University of Virginia, 1870; A. M., Yale, 1877; *Assistant of the Director of the Metropolitan Museum of Art in New York, 1879-80.*

The "Oath of Rhodamantus." (*Am. Philol. Assoc., 1878.*)

Discussion of the Periods to which the Egyptian and Assyrian Statues of Ancient Cyprus shall be assigned. (*Metropolitan Museum, N. Y., 1879.*)

25. FABIAN FRANKLIN (*Mathematics, 1877-79*), from Baltimore, Md.; Ph. B., Columbian University, 1869; Engineer Corps, Pittsburg and Connellsville Railroad, 1870-71; City Surveyor's Office, Baltimore, 1871-77; *Assistant in Mathematics, 1879-80.*

Bipunctual Coördinates. (*Amer. Jour. of Math., 1878.*)

Notes on Partitions of Numbers, etc. (*Am. Jour. of Math., 1878; 1879.*)

26. CHRISTIAN SIHLER (*Biology, 1877-79*), from Fort Wayne, Ind.; Concordia, 1866; M. D., University of Michigan, 1871; *Assistant in Biological Laboratory, 1879-80.*

On the so-called Heat-Dyspnoea. (*Jour. of Physiol., 1879.*)

27. FRANCIS GREENLEAF ALLINSON (*Greek and Sanskrit, 1877-80*), from Burlington, N. J.; A. B., Haverford, 1876, and

1877

A. M., 1879; A. B., Harvard, 1877; Temporary Instructor in Greek at Haverford College, 1878.

28. MAURICE BLOOMFIELD (*Sanskrit and Greek, 1878-79*), from Chicago, Ill.; A. M., Furman University, (S. C.), 1877; Ph. D., Johns Hopkins, 1879; *Fellow by Courtesy, Johns Hopkins University, and Student of Philology at Vienna, 1879-80.* Noun-Formation of Rig-Veda. (*Graduating Thesis, J. H. U., 1879.*)

29. CONSTANTINE FAHLBERG (*Chemistry, 1878-80*), from Tambow, Russia; Ph. D., Leipsic, 1873; Director of the United Brunswick-Hanover Metallurgical Laboratory, Oker, Harz-Mountains, 1874-75; Analytical and Consulting Chemist, New York City, 1875-76; Assistant in Dr. Halse's Technological Laboratory, London, 1876-77; Chemist of the Colonial Company, London and Demerara (South America), 1877-78.

Determination of Calcium Monosulphide in Boneblack. (*Zeitsch. f. analyt. chem.* 1871.)

On Oxyacetic Acid. (*Dissertation, Leipsic, 1873; Kolbe's Jour.* 1873.)

New Method for the Volumetric Estimation of Zinc. (*Zeitsch. f. analyt. chem.*, 1875.)

Description of the Manufacture of Cane Sugar in Demerara. (*Royal Gazette*, 1877.)

Method for the Manufacture of Zinc Carbonate from Zinc Sulphate. (*U. S. Patent Office*, 1878.)

A New Method for the Quantitative Estimation of Sulphur. (*Notes from Chem. Lab., J. H. U.*, 1878.)

On the Oxidation of Tolueneorthosulphamide. (*Ber. d. Deut. Chem. Ges.*, 1878.)

On the Liquid Toluenesulphochloride. (*Am. Chem. Jour.*, 1879.)

30. EDWIN HERBERT HALL (*Physics, 1878-80*), from Gorham, Maine; A. B., Bowdoin, 1875; Graduate Student of Physics at Johns Hopkins University, 1877-78.

On a New Action of the Magnet on Electric Currents. (*Am. Jour. of Math.*, 1879.)

31. EDWARD COLES HARDING (*Greek, 1878-79*), from Northumberland County, Va.; A. M., University of Virginia, 1876; *Lottsburg, Northumberland County, Virginia.*

32. ISAAC OTT (*Biology, 1878-79*), from Easton, Pa.; M. D., University of Pennsylvania, 1869; Resident Physician in St. Mary's Hospital, Philadelphia, 1870; Lecturer on Experimental Physiology in the University of Pennsylvania, 1876-77; A. M., Lafayette, 1877; *Physician, Easton, Pa.*

Cocain, Veratria and Gelsemium. (*Phila.*, 1874.)

Rapidity of Transmission of Nerve Force in Normal and Stretched Nerves. Extra Polar Katelectrotonus. (*Jour. of Nervous and Mental Diseases.*)

The Action of Medicine. (*Phila., Lindsay*, 1868.)

Sweat-Centres. The Action of Muscarin and Atropin on them. (*Jour. of Physiol.*, 1878.)

Observations on the Spinal Cord. (*Biol. Lab., J. H. U.; Jour. of Physiol.*, 1879.)

Also a large number of minor contributions to *Phila. Med. Times*; *Boston Med. Journal*; *Jour. of Nerv. and Ment. Diseases*, etc.

33. HENRY SEWALL (*Biology, 1878-79*), from Baltimore; S. B., Wesleyan, 1876; Graduate Student of Biology, and Assistant in Laboratory, at Johns Hopkins University, 1876-78; Ph. D., Johns Hopkins, 1879; *Fellow by Courtesy, Johns Hopkins University, and Student of Biology, at Leipsic, 1879-80.*

Development and Regeneration of Gastric Glandular Epithelium during Fœtal Life and after Birth. (*Jour. of Physiol.*, 1878.)

On the effect of Two Succeeding Stimuli upon Muscular Contraction. (*Jour. of Physiol.*, 1879.)

34. WASHINGTON IRVING STRINGHAM (*Mathematics, 1878-80*), from Topeka, Kansas; A. B., Harvard, 1877.

Investigations in Quaternions. (*Am. Acad., 1878.*)
Some General Formulæ for Integrals of Irrational Functions. (*Am. Jour. of Math., 1879.*)
The Quaternion Formulæ for Quantification and for Barycentres. (*Am. Jour. of Math., 1879.*)

35. ABRAM VAN EPPS YOUNG (*Chemistry, 1878-80*), from Grand Rapids, Mich.; Ph. B., University of Michigan, 1875; Assistant in Chemistry and Physics in the University of Michigan, 1875-77.

36. CHARLES ROBERT HEMPHILL (*Greek, 1878-79*), from Chester, S. C.; University of South Carolina, 1869; University of Virginia, 1871; Southern Presbyterian Theological Seminary, 1874, and Tutor in Hebrew in same, 1874-78; A. M., Davidson, 1878; *Professor of Ancient Languages in the Southwestern Presbyterian University, Clarksville, Tenn.*

37. ALLAN MARQUAND (*Logic and Ethics, 1878-80*), from New York City; St. Paul's School, Concord, N. H., 1871; A. B., Princeton, 1874; Tutor in Princeton College, 1876; Union Theological Seminary, New York, 1877; Student at Berlin, 1877-78.

38. CHARLES AMBROSE VAN VELZER (*Mathematics, 1878-80*), from Ithaca, N. Y.; S. B., Cornell, 1876; Instructor in Mathematics at Cornell University, 1876-77.

39. BROWN AYRES (*Physics, 1879-80*), from New Orleans, La.; S. B., Stevens Inst. of Technology, 1878; Graduate Student of Mathematics and Physics at Johns Hopkins University, 1878-79.

The Gramme Machine. (*Sc. Amer. Supp., 1876.*)

The Telephone. (*Jour. of Franklin Inst., 1878.*)

New Arrangement for Telephone. (*Sc. Amer. Supp., 1878.*)

Two New Forms of Bell Telephone. (*Jour. of Franklin Inst., 1878.*)

40. LOUIS BEVIER (*Greek, 1879-80*), from New Brunswick, N. J.; A. B., Rutgers, 1878; Graduate Student of Greek at Johns Hopkins University, 1878-79.

41. EDWARD MUSSEY HARTWELL (*Biology, 1879-80*), from Littleton, Mass.; Public Latin School, Boston, Mass., 1869; A. B., Amherst, 1873, and A. M., 1876; Vice-Principal of High School, Orange, N. J., 1873-74; Instructor in Public Latin School, Boston, 1874-77; Student in Miami Medical College, Cincinnati, Ohio, 1877-78; Graduate Student of Biology and Chemistry at Johns Hopkins University, 1878-79.

The Function of the Internal Intercostal Muscles. (*Conjointly with Prof. H. N. Martin, Jour. of Physiol., 1879.*)

42. JOHN ROBIN McDANIEL IRBY (*Mineralogy, 1879-80*), from Lynchburg, Va.; Miller Scholar of University of Virginia,

1873-75; S. B., University of Virginia, 1875; Ph. D., Göttingen, 1878.

Eine kritische Untersuchung ueber die bei dem kalkspath vorkommenden Skalenoeeder. (*Prize Essay of the University of Bonn, 1877, expanded and published under the title On the Crystallography of Calcite, Bonn, A. Marcus, 1878; abstract in Groth's Zeitschrift, Bd. III.*)

43. MITSURU KUHARA (*Chemistry, 1879-80*), from Tsuyama, Japan; Assistant in Chemical Laboratory in University of Tokio, Japan, 1878-79; Rigaku Shi, (S. B.), University of Tokio, 1879.

On the Red Colouring Matter of the Lithospermum erythrorhizon. (*Jour. of Chem. Soc., London, 1879.*)

44. OSCAR HOWARD MITCHELL (*Mathematics, 1879-80*), from Marietta, Ohio; A. B., Marietta, 1875, and A. M., 1878; Principal of High School at Marietta, 1875-78; Graduate Student of Mathematics at Johns Hopkins University, 1878-79.

45. EDWARD LEAMINGTON NICHOLS (*Physics, 1879-80*), from Peekskill, N. Y.; S. B., Cornell, 1875; Student of Physics at Leipsic, Berlin, and Göttingen, 1875-79; Ph. D., Göttingen, 1879.

Ueber die Volumenvermehrung der Flüssigkeiten durch Absorption von Gasen. (*Pogg. Annalen, 1878, N. F., Bd. 3.*)

Ueber das von glühendem Platin ausgestrahlte Licht. (*Inaugural Dissertation, Göttingen, 1879.*)

Papers on Radiation. (*Am. Jour. of Science, 1879*)

46. WALDO SELDEN PRATT (*Æsthetics and the History of Art, 1879-80*), from Williamstown, Mass.; Phillips Academy, Andover, Mass., 1874; A. B., Williams, 1878; Graduate Student of Greek and Archæology at Johns Hopkins University, 1878-79.

47. WILLIAM THOMSON SEDGWICK (*Biology, 1879-80*), from Farmington, Conn.; Ph. B., Yale, 1877; Student in Yale Medical School, 1877-78; Instructor in Physiological Chemistry and Toxicology in Sheffield Scientific School, 1878-79.

48. HERMAN VOORHEES (*Chemistry, 1879*), from Troy, New York; C. E., Rensselaer Polytechnic Inst., 1873; Graduate Student of Chemistry at Johns Hopkins University, 1878-79. Died October 14, 1879, without entering on the Fellowship, aged 27 years.

49.* CHARLES OTIS WHITMAN (*Biology, 1879*), from Newton Highlands, Mass.; A. B., Bowdoin, 1868, and A. M., 1871; Ph. D., Leipsic, 1878; Professor of Zoology in the University of Tokio, Japan.

The Embryology of Clepsine. (*Quart. Mic. Jour., London, 1878.*)

50. EDMUND BEECHER WILSON (*Biology, 1879-80*), from Geneva, Ill.; Ph. B., Yale, 1878; Assistant in Zoölogy at Yale College, 1877-79.

Description of two New Genera of Pycnogonida. (*Am. Jour. of Science, 1878.*)

The Pycnogonida of New England and Adjacent Waters. (*U. S. Fish Comm. Report, 1877.*)

* Did not enter upon the Fellowship.

51. **GEORGE FREDERICK NICOLASSEN** (*Greek, 1879-80*), from Baltimore, Md.; A. B., University of Virginia, 1879.

Appointed since September 1, 1879.

52. **WILLIAM BURNET** (*Chemistry, 1879-80*), from Davidson College, N. C.; S. B., Davidson, 1875; Ph. D., Heidelberg, 1879.

53. **ROBERT WOODWORTH PRENTISS** (*Mathematics, 1879-80*), from New Brunswick, N. J.; S. B., Rutgers, 1878; Graduate Student of Mathematics at Johns Hopkins University, 1878-79.

Dr. Brooks and Dr. Morse were appointed Associates before entering upon the Fellowships.

GRADUATES.

DOCTORS OF PHILOSOPHY.

1878.

HENRY C. ADAMS, . . . (*Fellow in Political Science, 1876-9.*)
THOMAS CRAIG, . . . (*Fellow in Physics, 1876-9.*)
JOSIAH ROYCE, . . . (*Fellow in Philosophy, 1876-8.*)
ERNEST G. SIHLER, . . . (*Fellow in Greek, 1876-9.*)

1879.

MAURICE BLOOMFIELD. (*Fellow in Sanskrit and Greek, 1878-9.*)
SAMUEL F. CLARKE, . . . (*Fellow in Biology, 1877-9.*)
GEORGE B. HALSTED, . . . (*Fellow in Mathematics, 1876-8.*)
EDWARD HART, . . . (*Fellow in Chemistry, 1876-8.*)
WILLIAM W. JACQUES, . . . (*Fellow in Physics, 1876-9.*)
HENRY SEWALL, . . . (*Fellow in Biology, 1878-9.*)

BACHELORS OF ARTS.

1879.

GEORGE W. MCCREARY, . . . (*Balt. City College, 1874.*)
 Matriculated Student, 1st, 2d, and 3d Academic Years, 1876-9.
A. CHASE PALMER, . . . (*Princeton College.*)
 Matriculated Student, 1st, 2d, and 3d Academic Years, 1876-9.
EDWARD H. SPIEKER, . . . (*Balt. City College, 1877.*)
 Matriculated Student, 2d, and 3d Academic Years, 1877-9.

UNIVERSITY SCHOLARS.

1876.

GEORGE W. MCCREARY, . . . (*Balt. City College.*) Baltimore.
ALLDIN M. SPRIGG, . . . (*St. John's College.*) Cumberland.

1877.

EDWARD H. SPIEKER, . . . (Ball. City College.) Baltimore.

1878.

WILLIAM W. BADEN, . . . (Steuart Hall.) Baltimore.

JOHN W. BROWN, . . (Mr. G. G. Carey's School.) Govanstown.

GRADUATE SCHOLARS.

1879.

A. CHASE PALMER, . . . (A. B., 1879.) Baltimore.

EDWARD H. SPIEKER, . . . (A. B., 1879.) Baltimore.

B.

Enumeration of Classes which have been instructed during the Academic Year 1878-9.

The following list shows the principal classes which have been organized and instructed during the year:

The figures given in parenthesis indicate in the case of classes the number of students, and in the case of public lectures the average number of auditors.

Mathematics. (38 Students.)

Determinants and Modern Algebra (8). *Twice weekly, through the year: Prof. Sylvester.*

Mathematical Seminary (12). *Once monthly, through the year: Prof. Sylvester and Dr. Story.*

Elliptic Functions (2). *Twice weekly, through the year: Dr. Story.*

Higher Plane Curves (6). *Thrice weekly, first half year: Dr. Story.*

Solid Analytic Geometry (7). *Thrice weekly, second half year: Dr. Story.*

Differential Equations (5). *Twice weekly, through the year: Dr. Story.*

Differential and Integral Calculus (12). *Thrice weekly, through the year: Mr. Franklin.*

Analytic Geometry (Conics) (5). *Thrice weekly, through the year: Mr. Franklin:—Instruction given chiefly by lectures from notes prepared by Dr. Story.*

Theory of Equations (1). *Twice weekly, first half year: Mr. Franklin.*

The results of special studies upon the following subjects, among others, have been examined and discussed in the Mathematical Seminary, under the direction of Prof. Sylvester and Dr. Story:—Newton's rule for the limits of roots of algebraic equations; the rule of signs in trigonometry; barycentric coördinates; double points of plane curves; the quasi evolute; central harmonic transformation; special cases of Pascal's hexagram; transformation by elliptic coördinates.

Physics. (32 Students.)

General Physics (19). *Two experimental lectures and three recitations weekly, through the year : Dr. Hastings.*

Thermodynamics (7). *Thirty mathematical lectures and ten recitations : Prof. Rowland.*

Electricity and Magnetism (8). *Eighty mathematical lectures and twenty-seven recitations : Prof. Rowland.*

Theoretical Dynamics (6). *Fifteen mathematical lectures : Dr. Craig.*

Spherical Harmonics (6). *Ten mathematical lectures : Dr. Craig.*

Hydrodynamics (7). *Twenty-four mathematical lectures : Dr. Craig.*
The substance of this course was given a second time in eleven lectures addressed to Civil and Military Engineers.

Theory of the Telescope (15). *Four lectures, to astronomers and mathematicians, delivered in Washington : Dr. Hastings.*

Laboratory Work for special Students (7). *Five times weekly, through the year : Prof. Rowland.*

Laboratory Work: Saturday Class for advanced Students (9). *Once weekly, through the year : Dr. Hastings.*

Laboratory Work: Saturday Class in General Physics (7). *Once weekly, through the year : Dr. Hastings.*

Reading and Discussion of current Physical Journals (7). *Once weekly, through the year.*

The Fellows and advanced students have also been engaged in researches under the direction of Prof. Rowland: In determination of the diamagnetic constants of bismuth and calc spar; on the distribution of heat in the spectrum of a platinum wire heated to various known temperatures; on the law of radiation at high temperatures; on the ratio of the electromagnetic to the electrostatic units of electricity; on various problems in hydrodynamics, etc.

Chemistry. (39 Students.)

General Chemistry (39). *Four lectures by Prof. Remsen, and two examinations by Dr. Morse, weekly, first half year*

General Chemistry (continued) (18). *Four lectures and two examinations weekly, second half year : Dr. Morse.*

Laboratory Work (30). *Four to eight hours daily, through the year : Prof. Remsen and Dr. Morse.*

Organic Chemistry (14). *Four lectures weekly, second half year : Prof. Remsen.*

Analytical Chemistry (11). *Once weekly, through the year : Dr. Morse.*

History of Chemistry (15). *Twelve lectures : Prof. Remsen.*

Reading and Discussion of current Chemical Journals (7). *Twice weekly, through the year.*

The Fellows and advanced students have also been engaged daily in the laboratory in following out various investigations, mostly under the direction of Prof. Remsen. The principal of these are: On the oxidation of cymenesulphamide; on the oxidation of orthotoluene sulphamide; on the oxidation of nitroxylenes; on the use of various oxidizing agents on the oxy-acids; comparison of sulpho-acids prepared by different methods. The results of the investigations referred to have either already been printed, or will soon be published in full in the chemical journals.

Biology. (26 Students.)

- General Biology (18). *Twenty lectures, with practical study in laboratory: Prof. Martin.*
 Animal Physiology: Advanced Course (8). *Twenty lectures, with demonstrations: Prof. Martin.*
 Animal Physiology: Elementary Course (18). *Fifty-five lectures, with practical work, demonstrations, and weekly examinations: Prof. Martin.—Examiners, Prof. Donaldson and Prof. Latimer.*
 Animal Morphology: Advanced Course (8). *Fifty lectures, with laboratory work: Dr. Brooks.*
 Animal Morphology: Elementary Course (6). *Sixty lectures, with laboratory work and weekly examinations: Dr. Brooks.—Examiner, Prof. Martin.*
 Embryology (7). *Twelve lectures, with laboratory work: Dr. Brooks.*
 Vegetable Morphology (9). *Twenty-four lectures, with laboratory work: Prof. Farlow.*
 Laboratory Instruction (26). *Daily through the year: Prof. Martin and Dr. Brooks.*

-
- Demonstrations in Animal Physiology to Medical Students (25). *Twenty lectures, illustrated with experiments: Prof. Martin.*
 Practical instruction in Animal Histology to Medical Students (12). *Sixteen lectures, with laboratory work: Mr. Sewall.*
 Teachers' Class in Zoölogy (15). *Fifteen lectures, with laboratory work, three hours a week for fifteen weeks: Dr. Brooks.*
 General Biology (66). *Twenty public lectures: Prof. Martin.*
 Various Botanical Topics (89). *Six public lectures: Prof. Farlow.*

During the year investigations have been carried on by advanced students, under the direction of Professors Martin and Brooks, in various subjects as follows:—Function of certain respiratory muscles; the respiratory functions of certain nerves; the phenomena of muscular contraction; the effect of increased temperature on the respiratory rhythm; the development of Amblystoma; the locomotion of Gasteropods, etc. The results of several of these investigations have been published.

During the summer of 1878 the Chesapeake Zoölogical Laboratory, for the study of forms of marine life, was conducted for eight weeks by Dr Brooks, at Fort Wool, Va., with an attendance of ten students. It was reopened at Crisfield, Md., June 25th, 1879, and continued there and at Fort Wool until September 15th. A party of twelve investigators availed themselves of its facilities.

Greek. (40 Students.)

- Lucian (12). *Once a week, through the year: Prof. Gildersleeve.*
 Aristophanes, *Frogs* (14). *Thirteen meetings: Prof. Gildersleeve.*
 Syntax of Moods and Tenses (6). *Once a week, from November to the end of the year: Prof. Gildersleeve.*
 Practical exercises in translating Greek into English and English into Greek at dictation. *Twice a week, from April to the end of the year: Prof. Gildersleeve.*
 Greek Seminary (18). *Once a week, through the year: Prof. Gildersleeve.*
 Thucydides (14). *Four times weekly, first half year: Prof. Morris.—Examiner, Mr. Savage.*

- Euripides, *Ion*, *Bacchae* (7). *Four times weekly, second half year*: Prof. Morris.—*Examiner, Prof. Gildersleeve.*
 Plato, *Phaedo* (7). *Five times weekly, first half year*: Prof. Cross.—*Examiner, Dr. E. G. Sihler.*
 Plato, *Protagoras* (2). *Four times weekly, for three months*: Dr. E. G. Sihler.
 Aeschylus, *Prometheus* (4). *Five times weekly, second half year*: Prof. Cross.—*Examiner, Prof. Gildersleeve.*
 Xenophon, *Anabasis* (8). *Four times weekly, second half year*: Prof. Cross.—*Examiner, Mr. Bevier.*
 New Testament Greek (8). *Once weekly, second half year*: Prof. Cross.
 Cyprus and Mycenae (81). *Eight public lectures*: Mr. Savage.
 New Testament (12). *Ten public lectures*: Prof. Cross.

Students have privately read and been examined in:

- Plato, *Apology*, *Crito* (1). *Examiner, Mr. Harding.*
 Herodotus, *lib. v-ix*. (1). *Examiner, Prof. Morris.*
 Euripides, *Phoen.*, *Alc.*, *Hippol.* (1). *Examiner, Prof. Gildersleeve.*
 Euripides, *Medea* (2). *Examiner, Prof. Gildersleeve.*
 Aeschines, in *Ctesiphont*. (1). *Examiner, Prof. Gildersleeve.*
 Demosthenes, *de Corona* (1). *Examiner, Prof. Gildersleeve.*
 Demosthenes, *Olynthiacs* (3). *Examiner, Prof. Morris.*
 Demosthenes, in *Lacritum* (8). *Examiner, Prof. Morris.*
 Sophocles, *Five Plays* (1). *Examiner, Prof. Everett.*
 Homer, *Iliad*, *i-ix*. (1). *Examiner, Prof. Gildersleeve.*

The exercises of the Greek Seminary have consisted in analysis, exegesis and criticism of selected tracts of Lucian, and in the prosecution of researches into the language of Lucian and the life of the second century, such as Lucian's relation to Herodotus, the Ionism of the *Dea Syria* and the *De Astrologia*, the use of the optative in Lucian. Lucian and Diogenes Laertius, traditions as to the oriental origin of Greek philosophy, the worship of the Syrian Goddess, Lucian's attitude toward religion, and Lucian as a student of art. Some of the more elaborate papers were transferred to the Johns Hopkins Philological Association. The Seminary was conducted by Prof. Gildersleeve.

Latin. (27 Students.)

- Juvenal (10). *Four times weekly, first half year*: Prof. Morris.—*Examiner, Prof. Maupin.* *Five times weekly, second half year*: Prof. Cross.—*Examiner, Prof. Morris.*
 Persius (8). *Four times weekly, first half year*: Prof. Morris.—*Examiner, Prof. Gildersleeve.*
 Cicero, *Brutus* (6). *Four times weekly, second half year*: Prof. Morris.—*Examiner, Prof. Maupin.*
 Cicero, *Orator* (6). *Four times weekly, second half year*: Prof. Morris.—*Examiner, Prof. Maupin.*
 Tacitus, *Annals* (9). *Five times weekly, second half year*: Prof. Cross.—*Examiner, Prof. Maupin.*
 Livy (18). *Five times weekly, first half year*: Prof. Cross.—*Examiner, Prof. Maupin.*

Students have privately read and been examined in

- Plautus, *Captivi* (1). *Examiner, Prof. Maupin.*
 Terence, *Phormio* (2). *Examiner, Prof. Maupin.*
 Terence, *Hautontim* (1). *Examiner, Prof. Maupin.*

Terence, *Andria* (3). Examiner, Prof. Maupin.
 Tacitus, *Germania, Agricola* (5). Examiner, Prof. Maupin.
 Tacitus, *Hist. lib. i.* (4). Examiner, Prof. Maupin.
 Cicero, *Select Letters* (1). Examiner, Prof. Morris.
 Cicero, *de Officiis* (1). Examiner, Prof. Maupin.
 Horace, *Satires* (1). Examiner, Prof. Everett.
 Horace, *Odes, Epodes* (6). Examiner, Prof. Everett.
 Virgil, *Aeneid* (5). Examiner, Prof. Everett.

German. (55 Students.) Prof. Brandt.—Examiners, Prof. Elliott and Prof. Raddatz.

Major Course (16). Five times weekly, first half year.
 Minor Course (17). Five times weekly, through the year.
 Goethe, *Faust* (15). Once weekly, through the year.
 Lessing, *Laokoon* (13). Once weekly, second half year.
 Middle High German [Nibelungenlied]. (7). Two lectures and two recitations weekly, second half year.
 Scientific German (14). Once weekly, second half year.
 German Literature (17). Six lectures.

French. (15 Students.) Prof. Rabillon.—Examiner, Prof. Elliott.

Major Course (10). Twice weekly, through the year.
 Minor Course (5). Twice weekly, through the year.
 Special Class. Once weekly, second half year.
 French Romantic Literature (35). Eleven public lectures.

Romance Languages. (3 Students.) Prof. Elliott.

Old French [Serments de Strassbourg; Cantilène de Sainte Eulalie; La Passion de Christ; Vie de Saint Léger; Vie de Saint Alexis]. (8). Five times weekly, through the year.
 Provençal [Poème sur Boèce; extracts from writings of Guillaume IX. Comte de Poitiers; the Roman de Girart de Rossilho]. (2). Once weekly, through the year.
 Scientific Grammar (3). Once weekly, through the year.
 Italian [Dante, *Purgatorio*]. (2). Twice weekly, through the year.
 Geographical Distribution of the Old French Dialects (3). Lectures weekly, through the year.
 Dante, *Divina Commedia* (152). Ten public lectures.

Sanskrit. (4 Students.) Prof. Lanman.

Hymns of the Rig Veda (1). Thrice weekly, through the year.
 Kathāsaritsāgara, and Yājñavalkya (1). Twice weekly, first half year.
 Elementary Sanskrit [Nala, Hitopadeṣa, Manu]. (3). Twice weekly, through the year.

Shemitic. (9 Students.) Prof. Murray.

Arabic (2). Twice weekly, first half year.
 Syriac (4). Thrice weekly, first half year.
 Biblical Hebrew (6). Twice weekly, first half year.
 Shemitic Literature (9). Twelve lectures.
 Hebrew: Elementary Course (3). Thrice weekly, through the year: Mr. Bloomfield.
 Poetical Books of Old Testament (41). Nine public lectures: Prof. Murray.

Logic. (6 Students.) *Mr. Marquand.*

Bacon's *Novum Organum* (2). *Twice weekly, second half year.*
 Inductive and Deductive Logic (5). *Four times weekly, second half year.—Examiner, Prof. C. D. Morris.*
 Elementary Course (2). *Thrice weekly, first half year.*

Ethics. (6 Students.)

History of English Ethics (4). *Once weekly, second half year: Mr. Marquand.*
 Reading Class (4). *Twice weekly, December and January: Mr. Marquand.—Examiner, Prof. G. S. Morris.*
 Topics Historical and Practical in Ethics (123). *Ten public lectures: Prof. G. S. Morris.*

History. (25 Students.)

Seminary of American History (10). *Once weekly, through the year: Dr. Scott.*
 European History during the Middle Ages (14). *Four times weekly, first half year: Dr. Adams.—Examiner, Dr. Scott.*
 German History (9). *Twice weekly for two months: Dr. Adams.*
 German Empire (268). *Ten public lectures: Prof. Von Holst.*
 Beginnings of Church and State (83). *Ten public lectures: Dr. Adams.*
 History of Greece in Fifth Century B. C. (89). *Ten public lectures: Dr. E. G. Sihler.*
 Thirty Years War (192). *Twenty public lectures: Prof. Diman.*

Political Science. (15 Students.)

Seminary of English Constitutional Law (15). *Six meetings; Prof. Cooley.*
 Political Economy (15). *Four times weekly, two months: Dr. Adams.*
 Evils in Local Government (87). *Six public lectures: Prof. Cooley.*

C.

List of Apparatus for Scientific Researches
 involving Accurate Measurements
 in the Physical Laboratory.

The list does not include apparatus for demonstration.

Republished, with additions, from Harvard University Library Bulletin,
 No. 12, 1879.

ACOUSTICS.

All the ordinary apparatus by Koenig of Paris, including Helmholtz's double siren, Lissajou's vibrating microscope, Hastings' pendulum comparator, &c.

OPTICS.

1. *Meyerstein Spectrometer*—large model. The circle is of 16 centimeters radius, divided on silver to 6' and reading by two microscopes to 2''. The probable and periodic errors of graduation have been investigated, and are given in the American Journal of Science, vol. xv. p. 270. Having a common axis with the large circle is a table rotating independently. 6.5 centimeters radius, graduated on a silver limb and by two verniers to single minutes. The massive stand has a joint by which the circle may be brought into a vertical plane. Aperture of telescope and collimator 4.0 centimeters, focal length 84 centimeters, powers from 13 upward. A smaller telescope 2.0 centimeters aperture, 18.0 centimeters focal length, power 7, may be placed on a third support rigidly connected with the microscope bearers. The accessories of this instrument are:—

(a). Two telescopes with Nicol prisms before objectives: longer diagonals of prisms, 2.0 centimeters; length of telescopes, 20.0 centimeters; power, 8; position angles of prisms read by circles of 3.5 centimeters radius to minutes of arc.

(b). Babinet's compensator with wedge of 8 centimeters available length.

(c). High power collimating ocular.

(d). Low power collimating ocular.

(e). Three micrometer eye-pieces.

2. *Spectrometer*, by Schmidt and Haensch. The circle has a silver limb 16 centimeters radius, divided to 6' and read by microscopes to 2''. Table in centre has a graduation 6.0 centimeters radius, reading by verniers to 1'. Aperture of objectives of telescope and collimator, 3.9 centimeters; focal length, 85.0 centimeters; power, 18. The angle between lines of collimation of telescope and the collimator may be read by small circle to single degrees.

3. *Steinheil's Spectroscope*. The clear aperture of train, including two 60° prisms, is 4.0 centimeters. Focal length of collimator and telescope 82.5 centimeters, powers, 8, 12, etc. Photographic scale.

4. *Silbermann's Helio-stat*, etc. This instrument, by Duboscq, has two mirrors 18.0 centimeters by 9.0 centimeters, one silver under glass and the other silver. Also, *porte-lumière*.

5. *Helio-stat*, with perfect plane mirror 16.8 c. m. diameter. Designed by Rowland and made by Schneider.

6. *Jamin's Interferential Refractometer*, with tubes 100 centimeters long, for the study of refraction in gases and a glass trough 20 centimeters long for liquids, by Duboscq.

7. Complete apparatus for the study of phenomena of interference, by Duboscq.

8. *Photographic Apparatus*. Objective 6.1 centimeters aperture, and about 40 centimeters focal length for plates; 10 × 12 inches, by Steinheil. Dark room, collection of chemicals and everything necessary for experiments on the subject.

9. *Becquerel's Phosphoroscope*, by Duboscq.

10. *Polarizing Apparatus*, from Steeg; also from Duboscq.

11. Apparatus for producing monochromatic light of any color. Designed by Hastings and made by Schneider.

12. *Prisms, gratings*, etc.

a. Hollow prism from Meyerstein; aperture, 6.1 × 5.2 centimeters.

b. Hollow prism from Steinheil; aperture, 2.2 centimeters.

c. Thallium glass prism from Steinheil; aperture, 4.8 centimeters.

d. Two flint glass prisms from Steinheil; aperture, 4.7 centimeters.

- e. Crown glass prisms from Steinheil; aperture, 4.8 centimeters.
- f. Two quartz prisms from Steeg; faces, 8.4×3.0 centimeters.
- g. Iceland spar prism; faces, 2.6×2.2 centimeters, by Steeg.
- h. Two rocksalt prisms; faces, 5.0×4.0 centimeters, by Steeg. Also rocksalt lens.
- i. Large Nicol prism, largest diagonal 6.5 centimeters. Also a number of smaller ones.
- j. Gratings on speculum metal 4.3×3.9 centimeters with 8648 lines to the inch and 4.4×4.4 centimeters with 17396 lines to the inch, and a smaller glass grating with 8648 lines to the inch, all by Chapman with Rutherford's engine.
- k. Kirchhoff's, Angstrom's, and Rutherford's maps of the solar spectrum.
- l. Old telescope by Dollond. Objective about 4 in. diameter and 6 ft. focal length.

ELECTRICITY AND MAGNETISM.

The distinguishing feature of the apparatus for these subjects is its accuracy and the determination of the constants in absolute measure. The collection is *unique* in this respect.

13. *Rowland's Absolute Electrometer* for potentials represented by sparks of about 0.1 to 1 inch. Designed on Sir Wm. Thomson's guard-ring principle and constructed by Edelmann of Munich. Guard-ring 38.5 centimeters diameter, and can be separated about 7 centimeters, the distance being read by vernier to 0.01 centimeter. Movable disc 10 centimeters diameter, and *firmly* attached to arm of a balance sensitive to 1 mgr. Balance moves only .01 centimeter, and means of two distances of the discs are taken, the one to move it to upper and the other to lower stop. Weights of from 1 to 5 grammes ordinarily used. *Discs ground and polished to mirror surface after nickel plating.*

14. *Rowland's Electrostatic Standard Condenser.* Constructed by Grunow of New York. One sphere within the other *nickel plated and ground to mirror surface*, with extra ball for interior. Balls, 7 and 8 inches diameter. Hollow sphere, 10 inches diameter. Apparatus for centering. Radii determined by loss of weight in water. Can be charged and discharged any number of times at the rate of three per second, by means of fine wires which pass in momentarily from outside and so do not change the capacity much. Any condenser can be compared with it by means of an electrometer.

15. *Thomson's Quadrant Electrometer*, by White of Glasgow, with Thomson's key.

16. *Condenser* $\frac{1}{2}$ microfarad by Elliott.

17. *Commutators* for high (say 1 inch spark) as well as low tension.

18. *Rowland's Galvanometer* for the absolute measurement of discharges of high tension. Constructed by Rowland and Schneider. Coils wound with paper between, and boiled in paraffine *in vacuo* at 100° C. to be thoroughly dry. Needle shielded from electrostatic action, and deflection read by mirror and scale. Number of coils about 11000. Constant on the cm. gr. second system 19091. = G of Maxwell as determined by comparison with galvanometer described in American Journal of Science, vol. xv., p. 384. See no. 19 below.

19. *Rowland's absolute Galvanometer* for the measure of quite weak currents Constant 1838.2. See American Journal of Science, vol. xv., p. 384. Constant very accurately known. 1790 turns. Can be used as sine galvanometer or with mirror and scale. Horizontal circle reads to

1', but is readily estimated to 30''. Telescope and bar for determining horizontal intensity in exact position of instrument.

20. *Rowland's Tangent Galvanometer*, brass circle 50 centimeters diameter. Circle graduated to 15' and 20 centimeters diameter. From 1 to 248 turns can be used, the constant of each set being known with great accuracy. Made by Meyerstein, but altered and wound and coils measured by Rowland.

21. *Two Thomson's Galvanometers* of high and low resistance, the first differential with coils around both needles and set of shunts. Made by Elliott of London.

22. *Two Nobili Astatic Galvanometers* by Elliott, and one by Salleron.

23. *Wiedemann Galvanometer* with two sets of coils and two kinds of needles. Reading by mirror and scale.

24. *Galvanometer* with large wire for experiments on the damping effect of the coils on the needle, and for determining resistances in absolute measure. Designed by Rowland and made by Schneider.

25. *Tangent Galvanometer*, wooden circle, with variety of coils of known constant.

26. *Mirror Galvanometer*.

27. *Rowland's wooden circle*, 84 centimeters diameter, carefully laid up out of maple wood, and containing several grooves on the edge to contain single wires. It is used to surround a galvanometer when, by the aid of the electro-dynamometer, the horizontal intensity can be measured at any instant. Extremely useful.

28. *Electrodynamometer* of form given in Maxwell's Electricity, vol. ii, p. 330. Outer circles about 27.5 centimeters diameter with 240 windings on each side. Constant, G , of outer coils 78.871 on cm. gm. second system. Inner coils about 5.5 centimeters diameter. with 63 coils in each. Moment of inertia of suspended coil accurately known. Constant calculated and also determined by comparison with a tangent galvanometer made of the circle described above. Made (partly) by Gurley of Troy, and circles wound and measured by Rowland.

29. *Electrodynamometer*, Quincke's form for weak currents. Made by Edelmann of Munich.

30. *Standards of Resistance* mounted so that they can be placed in water. 1 and 10 ohms by Elliott; 10, 100, and 1,000 ohms by Warden. Muirhead, and Clark of London; also mounted in another style 1, 10, and 100 Siemens' units, by Siemens and Halske of Berlin. Also three copies of coil whose absolute resistance was determined by Rowland as $84.719 \text{ earthquad. } \div \text{ sec.}$

31. *Resistance coils* in boxes 1 to 10,000 and 10,000 to 100,000 ohms by Elliott, and 1 to 10,000 Siemens' units by Edelmann.

32. *Rowland's Resistance Comparator*. Ten coils of 10 ohms each, arranged so that they can be joined in series or abreast thus making 1, 10, and 100 ohms besides intermediate ones. Made by Schneider and adjusted by Rowland.

33. *Two bridges* of Jenkins' form for the accurate comparison of equal resistances, and also a Wheatstone bridge, having wire of platinum-iridium alloy one meter long, by Elliott.

34. *Magneto-electric Machine* for 1,200 candles, by Siemens Brothers, London, with engine to drive it, and both Siemens' and Foucault's lamps. Also battery of 60 large bichromate cells.

35. *Ruhmkorff coil*, spark 15 or 20 centimeters, by Ruhmkorff of Paris.

36. *Rowland's Earth inductor* with brass circle. 80 centimeters diameter, wound and measured by Rowland. Made by Meyerstein of Göttingen.

37. *Ruhmkorff's Apparatus* for diamagnetism. Made by Ruhmkorff of Paris.

38. *Electric Clocks* beating seconds from regulator.

39. *Rowland's Standard of Electromagnetic Induction*. Three coils on brass cylinders which can be placed accurately on top of each other. See American Journal of Science, Vol. XV. Mutual potential of coils with unit current 3775500., 2561974., 2051820, etc., on the cm. grm. second system.

40. *Telescopes, Scales, and Mirrors*. Silvered brass millimeter scale by Brown and Sharp. Mounted telescope by Steinheil, objective 4.0 centimeters diameter, with three oculars, giving powers of 20, 40, and 80. Unmounted telescope by Steinheil, objective 2.7 centimeters diameter, and 8 oculars.

Mounted telescope and paper scale by Meyerstein : objective, 2.7 centimeters diameter.

41. Thin mirrors and plain parallel glasses by Steinheil. The mirrors give a perfect image of the highest magnifying power.

Thomson's Replenisher on large scale for use with electrometer, Holtz and friction machines, Leyden jar batteries, Geissler tubes, &c.

HEAT.

42. *Rowland's Instrument for comparing the mercurial with the air Thermometer* between 0 and 100° C. Constructed by Schneider. Readings seldom differ more than 0.02° or 0.03° C. at any one point, especially up to 40° C., and a change is contemplated which will much improve it.

43. *Rowland's Instrument for comparing Thermometers* from 0° to about 300° C. Constructed by Schneider. Accurate to about 0.1° C.

44. *Regnault's Air Thermometer*, Golaz, Paris.

45. *Jolly's Air Thermometer*, by Berberich, Praeparator, Phys. Inst., Univ. of Munich.

46. *Regnault's Apparatus for Expansion of Gases* both at constant pressure and constant volume, also Regnault's form of Rudberg's apparatus, Golaz, Paris.

47. *Regnault's Apparatus for Tension of Vapors*, including: a. The boiler; b. The reservoir for compressed air; c. A rotary pump for compressing gases; d. Mercurial manometer. Maker, Golaz, Paris.

48. *Regnault's Apparatus for specific Heat* of solids, Golaz, Paris.

49. *Regnault's Hygrometer with Aspirator*, Golaz, Paris.

50. *Thermometers*, about 30 or 40, principally by Baudin, Paris, and Geissler, of Bonn. Many of these have been compared with the air thermometer as well as with standards by Fastré, Casella, or from Kew. The thermometers up to 40° C. undoubtedly represent the air thermometer more accurately than any so far constructed, and are supposed to agree with it to about 0.01° C. They have been compared with it eight times during about one year or more. The error in calorimetric investigations from using uncomparated thermometers may amount to two per cent.

51. *Rowland's Apparatus for determining Change of specific Heat of Liquids* with temperature. Constructed by Schneider.

52. *Dulong's Apparatus for the Heat of Combustion*, Salleron, Paris.

53. *Melloni's Apparatus* for radiant energy, Salleron, Paris.

54. *Two Instruments for the Calibration* of mercurial thermometers, one by Golaz and the other by Salleron.

55. *Rowland's Apparatus for determining the mechanical Equivalent of Heat*, or for investigating the specific heat of liquids and their change with rise of temperature.

This instrument was constructed by the aid of funds contributed by the Rumford committee of the American Academy of Arts and Sciences, but the instrument will remain for the present at Baltimore. It was constructed by Schneider. It is run by a petroleum engine, No. 67 below.

* * To be constructed soon:—

Apparatus for compressing gases to 1000 atmospheres.

Apparatus for accurately determining the form of the adiabatic curve of gases and vapors at any temperature up to about 100° C.

MISCELLANEOUS.

56. *Comparator*, by Meyerstein, for bars 1 meter long. Microscopes cannot be set nearer than 10 centimeters. One division of head of micrometer screws is about $\frac{1}{100}$ millimeter.

57. *Microscope Comparator*, designed by Rowland after Rogers' plan, and made by Grunow.

58. *Dividing Engine*, by Perreaux. Free motion about 55 centimeters. Screw, $\frac{1}{2}$ millimeter thread. Head divided into 250 parts. 501 divisions of head gives 1 millimeter almost exactly. Subsidiary screw at right-angles to the other.

59. *Air Pumps*. Rotary and common, by Ritchie, of Boston; mercury, on Jolly's plan, by Berberich, of Munich.

60. *Rotary Pump* for compressing gases to 15 atmospheres, Golaz, Paris.

61. *Three Mercury Guages*; one about 25 meters high, and measuring pressures up to about 38 atmospheres; one movable and measuring pressure from 1 to 4 atmospheres; and one measuring from 0 to 1 atmosphere.

62. *Barometer*, by James Green of New York, with very large tube.

63. *Two Cathetometers*, one by Meyerstein, and the other by Salleron.

64. *Standard Meters*, compared at Washington.

65. *Balances and Weights*. One balance weighing to 5 kilo. and accurate to about 1 mg. with weights from 5 kilo. to 1 mg. One weighing to 200 grms. accurate to about 0.1 mg. with weights from 100 gr. to 1 mg. These are by Schickert of Dresden. One heavy balance weighing to about 25 kilo. and accurate to about 0.1 grm. by Schneider.

Standard glass kilogramme on Jolly's plan, and compared with Berlin standard. From Berberich in Munich.

The first balance mentioned is mounted on top of a case, so that globes for weighing gases can be suspended beneath it.

66. *Clock-work* with Foucault's regulator for running small apparatus at a regular velocity.

67. *Petroleum Engine* of three-horse power. It is capable of giving a large amount of compressed air at more than 100 pounds to the square inch pressure, and might be used for repeating Thomson's and Joule's experiments, or any others on the flow of gases.

68. *Two Spherometers*, large by Meyerstein, and small by Salleron.

69. Several extra micrometer eye-pieces.

70. *Apparatus for Researches on the Flow of Liquids*. Greatest available head about 1.4 meters.

71. *Revolving mirror* capable of 250 revolutions per second. Mirror of glass silvered on both sides and 4.7 cm. diameter. Driving power, compressed air from a Root blower. Designed by Rowland and made by Schneider.

72. *Metallic Manometer* for very minute differences of pressure, from Edelmann of Munich.

* * Nos. 19, 25, 26, and 28 and the silvered scale of No. 40 belong to Professor Rowland, but are used in the laboratory.

List of the More Important Physiological Apparatus in the Biological Laboratory.

1. Eighteen microscopes, by Zeiss of Jena; magnifying 60, 110, 220 and 400 diameters.
2. One complete monocular microscope, by the same maker, with a set of oculars and objectives magnifying from 10 to 1700 diameters. Also, a microspectroscope and polarising apparatus, camera lucida, condenser, &c.
3. Two Stricker's "hot stages."
4. Two ditto, with Shäfer's self-regulating apparatus for maintaining a constant temperature.
5. Two Zeiss and six other microtomes.
6. Two Zeiss dissecting microscopes.
7. Four DuBois-Raymond induction coils.
8. Dewsmith's levers. Made of Aluminium and delicately poised; working on steel points in agate cups. The two levers work vertically over one another in the same plane and are available for recording very feeble movements.
9. Kronecker's capillary contact apparatus, much improved, giving any desired number of contacts from 1 to 50 per second.
10. Bernstein's "*acustische unterbrecher*," somewhat modified.
11. Resistance coil 1-10 to 100 ohms. Elliott, London.
12. Reochoord and Wheatstone's bridge. Elliott, London.
13. Seconds clock, with electric connections for working chronographs, &c.
14. Thomson's reflecting galvanometer and shunt. Resistance 6601 ohms at 16.5° C.
15. Thomson's reflecting galvanometer. Resistance 0.4347 ohm at 23° C.
16. Metronome, with electrical attachment, giving contacts from 6 to 200 times in a minute.
17. Six small thermopiles.
18. König's recording tuning forks, three pairs, vibrating respectively 50, 100 and 200 times in a second.
19. "Signal," of Deprez, working up to 250 vibrations per second.
20. Marey's chronograph, working up to 100 vibrations per second.
21. Martin's self-feeding chronograph pens (4).
22. Helmholtz's electromotor. Zimmerman, Heidelberg.
23. Bernstein's rheotom. Zimmerman, Heidelberg.
24. Pendulum myographion, modified from Fick's: available for the measurement and analysis of rapid movements. The instrument consists essentially of a pendulum carrying a glass plate at the bottom, swinging on friction rollers, and corrected for the latitude of Baltimore, so as to swing in one second. Behind the pendulum is a divided arc, and the amplitude of the swing can be varied from a few inches to four feet. In use, an electro-magnet is moved along the divided circle, and then—the current being closed through it—the pendulum on being raised is held by it. On the other side is a catch, also movable along the arc. By turning a key at the side, the current in the electro-magnet is broken, and the pendulum swings across, and is held by the catch on the other side. During its transit, the movement to be analyzed is inscribed on the glass plate, which is previously smoked. Designed by A. G. Dewsmith, Esq., Trinity College, Cambridge, England. Made by Elliott, London.

25. Brunton's double myograph.
26. Ludwig's kymographion, (2), one with an improved regulator.
Fulcher, Cambridge, Eng.
27. Kymographion, modification of the above, giving both slower and
more rapid movement. Warden, Muirhead & Clark, London.
28. Ludwig's stromuhr.
29. Mosso's plethysmograph.
30. Marey's sphygmograph.
31. Injecting apparatus, with water pressure.
32. Czermak's rabbit holders (2).
33. Bernard's dog holders (2).
34. Spectroscope, by Browning, London, (one prism.)
35. Wild's polaristrobometer.
36. Rotating cylinder, run by clockwork. Hawksley, London.
37. " " " " Baltzar, Leipsic.
38. " " " " Fulcher, Cambridge.
39. Marey's tambours (8)
40. Kronecker's digestion apparatus.
41. Seconds pendulum, for breaking electric currents.
42. Roy's apparatus for measuring changes in arterial pressure. (*Jour.*
Physiol., Vol. II, p. 68.)
43. Warm chamber with self-regulating apparatus for maintaining a
constant temperature.

Apparatus available only for teaching purposes or demonstration is excluded from this list; as also the ordinary outfit of every laboratory—as balances, glass ware, thermometers, filter pumps, electric batteries and keys, electrodes, surgical instruments, moist chambers, muscle levers, &c., &c.

Chemical Laboratory.

The Chemical Laboratory is a new building well arranged and equipped. It has the usual collection of balances; platinum and silver utensils; a spectroscope; a polarizing apparatus, made by Herman and Pfister; a goniometer, made by Fuess of Berlin, such as is described in Groth's *Physikalische Krystallographie*. The circle of the goniometer is of silver, and is divided to $\frac{1}{4}^{\circ}$; it has two verniers which read to $30''$, and angles may be readily estimated to $10''$. It has two telescopes, one to focus the image of a slit, and the second, to observe the crystals and image of the slit.

D.

Report of Chesapeake Zoölogical Laboratory.

Summer of 1879.

To the President of the Johns Hopkins University:

DEAR SIR: In accordance with your request I have the honor to submit the following report of the Second Session of the Chesapeake Zoölogical Laboratory.

ORGANIZATION.

In order to present an opportunity for studying the oyster beds of the Bay, and thus secure the cooperation of Maj. Ferguson, Assistant U. S. Fish Commissioner, I determined to open the laboratory at Crisfield, a point which is unfavorable in most other respects. The laboratory was accordingly opened at Crisfield on the 25th of June in three of the barges of the Maryland Fish Commission.

I stated in the preliminary announcement that the laboratory would be moved to some more desirable locality farther down the Bay, about July 10th, but the transportation of the barges was attended with so much expense that I was not able to move them to the second station, and we occupied them at Crisfield until August 8th. During part of this time Maj. Ferguson's steam yacht, the Lookout, which he had fitted up with steam dredging apparatus for the purpose, was with us, and rendered valuable help in dredging and collecting. Through Maj. Ferguson's influence we also had the use of a small steam launch which was detailed for the purpose from the U. S. Navy.

Early in August the mosquitoes became so numerous as to render the barges uninhabitable, and as I was not able to move them, we transferred our outfit to our old quarters at Fort Wool, which had again been placed at our service by Maj. Gen. Q. A. Gillmore, U. S. A.

The party remained at Fort Wool until September 15th, thus extending the second session of the laboratory over eleven weeks.

The following is a list of the members of the party.

MEMBERS OF THE STAFF.

W. K. BROOKS, Ph. D., *Associate in Biology.*

In charge of Laboratory.

S. F. CLARKE, Ph. D., *Assistant in Biological Laboratory.*

Assistant in Laboratory.

B. W. BARTON, M. D., *Baltimore.*

EMIL BESSELS, M. D., Ph. D., *Smithsonian Institution.*

E. A. BIRGE, Ph. D., *Prof. of Zoology, Univ. of Wisconsin.*

H. C. EVARTS, M. D., *Acad. of Science, Philadelphia.*

E. A. NUNN, M. A., *Prof. of Biology, Wellesley College.*

H. J. RICE, M. A., *Cazenovia, N. Y.*

E. B. WILSON, Ph. B., *Johns Hopkins University.*

K. MITSUKURI, Ph. B., *Yale College.*

AUGUST SCHMIDT, M. A., *Baltimore.*

C. SIHLER, M. D., *Johns Hopkins University.*

SCIENTIFIC INVESTIGATIONS.

As most of the members of the party were trained investigators the amount of work which we were able to accomplish was very satisfactory.

Some of it is now in press, and there are a number of completed papers ready for publication, and I hope that means for this purpose will be found during the year.

It is impossible to give a short statement of the results of the prolonged study of a technical scientific problem, and I must refer to future publications for information regarding the work which was accomplished by our party. The following is a list of those subjects in regard to which our labors were most fruitful in new information:

Dr. Clarke devoted most of the season to the collection and study of Hydroids, and he finds that most of the species which occur in the Bay are new to science. Interesting hydroids were found in great abundance, but the season proved to be too short for the thorough study of all the forms which were collected, though in addition to the description of a number of new species, Dr. Clarke was able to make important observations upon their structure, manner of growth, and other points of interest.

Prof. Birge succeeded in making a very complete series of observations upon the larval stages of two genera of crabs. He traced these from the egg to the adult form, and secured a complete series of drawings showing each appendage at each stage of development.

The interesting field upon which Prof. Birge has thus made a beginning, is one in which the Chesapeake Bay furnishes unrivalled facilities, and a number of workers could easily find here material for years of study. I hope that future years will show important results from the investigation of the development of the crustacea of the bay, for this is undoubtedly the subject upon which the laboratory may be expected to yield the most abundant and valuable contributions to science.

Prof. Birge, together with myself, made several attempts to make a careful study of the development of the edible crab, but stormy weather prevented us from completing our work, and we must wait for future opportunities to complete the observations which we were able to make this season.

Prof. Nunn studied the development of the Ctenophoræ, especially *Nemopsis*, and obtained interesting results regarding the changes which accompany the fertilization of the egg.

Besides working upon other subjects, Mr. Wilson carefully revised the change of the *Actinotrocha* into *Phoronis*. He succeeded in raising the *Phoronis* from the *Actinotrocha*, and in keeping it until all the adult characteristics were acquired, and he not only verified the results of previous writers, but also added many observations regarding the details of the process of transformation.

Most of my own time was spent in studying the development and artificial propagation of the oyster. I obtained information upon a number of obscure points in molluscan development, and I also reached very unexpected conclusions regarding the breeding habits of the American oyster. I have reason to believe that these investigations will prove to be of great economic importance.

I also succeeded in obtaining a very complete series of stages in the development of the Squid, and among other new points, I have detected the presence of a rudimentary velum in this group of Molluscs.

Owing to the uncertainties which attend work at the ocean, upon living animals, our unfinished investigations are much more numerous than those which were made sufficiently complete for publication, and the list given above does not, by any means, represent all our work.

While we made no attempt to find or to describe new species, a few new representations of groups of especial interest have been sent to specialists on these groups for examination, and illustrated descriptions of some of them will soon be published.

Yours very truly,

W. K. BROOKS.

E.

Titles of Papers Presented to the Scientific
and Literary Associations, 1878-79.

JOHNS HOPKINS PHILOLOGICAL ASSOCIATION.

PRINCIPAL PAPERS.

- On the Special Province of the American Philologist. Oct. 4, 1878.
By B. L. GILDERSLEEVE.
- On the True Basis of Vowel-Classification. Nov. 1, 1878. By H. C. G.
BRANDT.
- On the Original Case-Form in Shemitic. Dec. 6, 1878. By T. C.
MURRAY.
- On the Bilingual Cypriote Inscription of Dali. Jan. 10, 1879. By A.
D. SAVAGE.
- On Ionic Forms in the Second Century, A. D. Feb. 7, 1879. By F. G.
ALLINSON.
- Lucian and Greek Philosophy. March 7, 1879. By E. G. SIHLER.
- On the Words of Relationship in Indo-European. April 4, 1879. By
M. BLOOMFIELD.
- On the Relation of the Asinus of Lucian to the Metamorphoses of Apu-
leius. May 9, 1879. By C. D. MORRIS.

MINOR COMMUNICATIONS.

- On Prof. Sauveur's "Natural Method" as used in the Normal School of
Modern Languages. By L. RABILLON.
- On Declined Words in Composition and some Results drawn from their
Study. By M. BLOOMFIELD.
- On Tentative Linguistic Forms and their Significance for a Question of
Linguistic Philosophy. By C. R. LANMAN.
- On Homer and Strabo. By E. G. SIHLER.
- On the Introduction of Italian Literature—particularly that of Dante—
into Hungary. By A. M. ELLIOTT.
- On the Use of the Question in Lysias. By F. G. ALLINSON.
- A Tabular Statement of the Cases of Agreement and Non-Agreement
with Grimm's Law in the Words contained in the Gothic Version of
St. Matthew's Gospel. By C. DAVIDSON, of Mitchellville, Iowa.
- On the Coincidence of the Results of Grammatical Investigation with
the Results of other Methods of Criticism, and on the Mutual Confr-
mation of the Results of Grammatical Criticism. By C. R. LANMAN.
- On the Theory of Ross that Tacitus' History was written by Bracciolini.
By C. D. MORRIS.
- On Low-back-narrow-round Vowels as Pronounced by Foreigners. By
H. C. G. BRANDT.
- On the Etymologies of the Word *trouver*. By S. GARNER.
- On the Latin Asseverative and Interrogative Particles. By M. WAR-
REN, of the University of Bonn.
- Attic Inscriptions of the Fifth Century B. C., referring to the Tribute of
the Attic Confederation. By E. G. SIHLER.
- On the Word "Copula" in Logic. By A. MARQUAND.
- On Expressions for Time in Later Greek. By F. G. ALLINSON.

The average number of members present was about 20.

**HISTORICAL AND POLITICAL SCIENCE ASSOCIATION OF
THE JOHNS HOPKINS UNIVERSITY.**

PRINCIPAL PAPERS.

- The Stone Age. A Review of Recent Works on Prehistoric Archaeology.
By H. B. ADAMS.
A Study of German Social Democracy. By A. MARQUAND.
Primitive Aryan Mythology from the Standpoint of Indian Literature.
By M. BLOOMFIELD.
Methods of Historical Inquiry as Pursued at German Universities. By
H. VON HOLST.
Methods of Historical Instruction as Pursued at Brown University. By
J. L. DIMAN.
Maryland's Ratification of the Federal Constitution. By A. SCOTT.
The Problem for Political Economy in the United States. By H. C.
ADAMS.

MINOR COMMUNICATIONS.

- The Swiss Lake-Dwellings. By C. R. LANMAN.
The Depopulation of Central Greece in the Post-Classical Period. By E.
G. SIHLER.
A Review of the Question, "Was Maryland a Roman Catholic Colony?"
By H. B. ADAMS.
Recent Complications in the School System of New Haven. By D. C.
GILMAN.
Notes on Niebuhr's Life and Works. By E. G. SIHLER.
Lieber's "Reminiscences of Niebuhr." By D. C. GILMAN.
Animistic Religion an Excrescence, not a Germ, of Vedic Religion. By
C. R. LANMAN.
The Boundary Controversy between Maryland and Virginia. By E.
GOODMAN.
The First Public Proposal of a Constitutional Convention for the United
States. By A. SCOTT.
The Position of Socialism in the Historical Development of Political
Economy. By H. C. ADAMS.
Moral Insanity as a Cause of Crime. By C. W. NICHOLS.
Attic Colonization. By E. G. SIHLER.

**SCIENTIFIC ASSOCIATION OF THE JOHNS HOPKINS
UNIVERSITY.**

PRINCIPAL PAPERS.

- The Work of the Chesapeake Biological School during the Summer of
1878. By H. SEWALL.
Observations on the Light of the Corona during the last Solar Eclipse.
By C. S. HASTINGS.
The Development of Lingula. By W. K. BROOKS.
Some Recent Investigations in Chemistry. By I. REMSEN.
A Problem of Isomerism. By F. FRANKLIN.
A Method for the Preparation of Isopropyltoluol. By H. N. MORSE.

- Extract of a Letter from Professor Frankland, referring to the Experiments of Lockyer "on the Nature of the so-called Elements." By J. J. SYLVESTER.
- The Effect of Changes of Interval of Stimulation on the Height of Tetanus. By H. SEWALL.
- On Floating Magnets. By B. AYRES.
- On Electric-Light Apparatus. By H. A. ROWLAND.
- Toluolsulpho Acids and their Oxydation Products. By C. FAHLBERG.
- The Motion of a Solid in a Mass of Frictionless, Incompressible Fluid. By T. CRAIG.
- The Function of the Internal Intercostal Muscles. By E. M. HARTWELL.
- Lockyer's Investigations in Relation to the so-called Elements. By C. S. HASTINGS.
- An Apparatus for Gas Analysis. By A. V. E. YOUNG.
- A New Determination of the Ratio of the Electro-Static and Electro-Magnetic Units. By E. H. HALL.
- Degradation by Parasitism. By W. K. BROOKS.
- Some Phenomena of Oxydation. By L. B. HALL.
- Distribution of Heat in the Spectra of Various Substances. By W. W. JACQUES.
- A Review of a Paper by Professor Sylvester "on a Method of Investigating Fluid Motion." By T. CRAIG.
- A New Method for the Determination of the Dynamical Equivalent of Heat. By L. B. FLETCHER.
- The Method of Locomotion in the Gasteropod Mollusks. By S. F. CLARKE.
- The Influence of Increased Temperature on the Respiration of Animals. By C. SIHLER.
- The Oxydation of Toluene-Disulphamide. By C. FAHLBERG.
- A Brief Statement of the Work of the Year 1878-9 in the Chemical Laboratory. By I. REMSEN.

F.

List of Scientific Papers Published by Members of the University, 1876-79.

MATHEMATICS.

BY PROFESSOR SYLVESTER.

In the American Journal of Mathematics.

Application of the New Atomic Theory to the Graphical Representation of the Invariants and Covariants of Binary Quantics.

On Differentiants Expressed in Terms of the Differences of the Roots of their Parent Quantics.

Note on M. Hermite's Law of Reciprocity.

Completion of the Theory of Principal Forms.

Additional Illustrations of the Law of Reciprocity.

On the Principal Forms of the General Sextinvariant to a Quartic and Quartinvariant to a Sextic.

On the Probable Relation of the Skew Invariants of Binary Quintics and Sextics to one another and to the Skew Invariant of the same Weight of the Binary Nonics.

On Clebsch's "Einfachstes System associirter Formen" and its Generalization.

Note on the Ladenburg Carbon-graph.

Note on the Theorem contained in Prof. Lipschitz's Paper entitled "Demonstration of a Fundamental Theorem obtained by Mr. Sylvester" in *Am. Jour. of Math.*, I, pages 336-341.

A Synoptical Table of the Irreducible Invariants and Covariants to a Binary Quintic, with a Scholium on a Theorem in Conditional Hyperdeterminants.

Notes on Determinants and Duadic Disynthesemes. Two papers.

On the Complete System of the "Grundformen" of the Binary Quantic of the Ninth Order.

Tables of the Generating Functions and Groundforms for the Binary Quantics of the First Ten Orders.

On the Resolution of Numbers into the Sum or Difference of two Cubes.

In the Proceedings of the Royal Society, London.

The compiler of this list is informed that there are one or two communications by Professor Sylvester in the Proceedings of the Royal Society for 1878; but the Proceedings for that year are wanting in the Baltimore sets, and accordingly the titles cannot here be accurately stated.

In the Messenger of Mathematics, London.

Rule for Abbreviating the Calculation of the Number of In- or Covariants of a given Order and Weight in the Coefficients of a Binary Quantic of a given Degree. (1878).

Note on Continuants. (1878).

On a Theorem connected with Newton's Rule for the Discovery of the Imaginary Roots of Equations. (1879).

In the London, Edinburgh and Dublin Philosophical Magazine, London.

On a Generalization of Taylor's Theorem. (1877).

Proof of the Hitherto Undemonstrated Fundamental Theorem of Invariants (1878).

Note on an Equation of Finite Differences. (1879).

In the Educational Times, London.

Mathematical Questions for Solution, of an Original Character and embodying Distinct Theories, Monthly during the Years 1876-79, in Continuance of a Series, begun many years ago.

Journal für reine und angewandte Mathematik, (Crelle), Berlin.

Sur les actions mutuelles des formes invariantives dérivées. (1878).

Sur les déterminants composés. (1879).

Sur un déterminant symétrique qui comprend comme cas particulier la première partie de l'équation séculaire. (1879).

Note sur une propriété des équations dont toutes les racines sont réelles. (1879).

Sur l'entrelacement d'une fonction par rapport à une autre. (1879).

Preuve instantanée d'après la méthode de Fourier, de la réalité des racines de l'équation séculaire, (1879).

In the Comptes Rendus de l'Académie des Sciences de l'Institut de France.

Sur les invariants fondamentaux de la forme binaire du huitième ordre. (1877).

Sur une méthode algébrique pour obtenir l'ensemble des invariants et des covariants fondamentaux d'une forme binaire. (1877).

Sur une méthode algébrique pour obtenir l'ensemble des invariants et des covariants fondamentaux d'une forme binaire et d'une combinaison quelconque de formes binaires. (1877).

Sur le vrai nombre des covariants élémentaires d'un système de deux formes biquadratiques binaires. (1877).

Théorie pour trouver le nombre des covariants et des contrevariants d'ordre et de degré, donnés linéairement indépendants d'un système quelconque de formes simultanées, contenant un nombre quelconque de variables. (1877).

Sur les invariants. (8 papers.) (1877)

Sur la loi de réciprocité pour les invariants et covariants des quantics binaires. (1878).

Sur la théorie des formes associées de MM. Clebsch et Gordan. (1878).

Détermination d'une limite supérieure au nombre total des invariants et covariants irréductibles des formes binaires. (1878).

Sur les covariants fondamentaux d'un système cubo-quadratique binaire. (1878.)

Sur le vrai nombre des formes irréductibles du système cubo-biquadratique. (1878).

Détermination du nombre exact des covariants irréductibles du système cubo-biquadratique binaire. (1878).

Sur les covariants irréductibles du quantic du septième ordre. (1878).

Sur la forme binaire du septième ordre. (1878).

Sur la valeur moyenne des coefficients dans le développement d'un déterminant gauche ou symétrique d'un ordre infiniment grand et sur les déterminants doublement gauches. (1879).

Table des nombres de dérivées invariantes d'ordre et de degré donnés, appartenant à la forme binaire du dixième ordre. (1879).

Sur la valeur moyenne des coefficients numériques dans un déterminant gauche d'un ordre infiniment grand. (1879).

Sur une propriété arithmétique d'une certaine série des nombres entiers. (1879).

Sur le vrai nombre des covariants fondamentaux d'un système de deux cubiques binaires.

BY DR. STORY.

In the American Journal of Mathematics.

On the Elastic Potential of Crystals.

Note on the Paper of MR. KEMPE, entitled the "Geographical Problem of the Four Colors," in the Am. Jour. of Math., II, 3.

BY DR. T. CRAIG.

Motion of a Point on the Surface of an Ellipsoid. (*Am. Jour. of Math.*, I).

The Motion of a Solid in a Fluid. (*Am. Jour. of Math.*, I).

Mathematical Theory of Fluid Motion. (*Van Nostrand's Eng. Mag.*, 1879).

General Differential Equation for Developable Surfaces. (*Jour. of Franklin Inst.*, 1879).

Projection of the General Locus of Space of Four Dimensions into Space of Three Dimensions. (*Am. Jour. of Math.*, II).

The Motion of an Ellipsoid in a Fluid. (*Am. Jour. of Math.*, II).

BY MR. F. FRANKLIN.

Bipunctual Coordinates. (*Am. Jour. of Math.*, I).

On a Problem of Isomerism. (*Am. Jour. of Math.*, I).

Notes on Partitions of Numbers, etc. (*Am. Jour. of Math.*, I, II).

BY DR. G. B. HALSTED.

Bibliography of Hyper-Space and Non-Euclidean Geometry. (*Am. Jour. of Math.*, I).

Note on the First English Euclid. (*Am. Jour. of Math.*, I).

BY MISS CHRISTINE LADD.

Quaternions. (*Analyst*, 1877).

The Polynomial Theorem. (*Analyst*, 1878).

On some Properties of Four Circles Inscribed in One and Circumscribed about Another. (*Analyst*, 1878).

On Pascal's Hexagram. (*Am. Jour. of Math.*, II).

BY MR. W. I. STRINGHAM.

Some General Formulae for Integrals of Irrational Functions. (*Am. Jour. of Math.*, II).

The Quaternion Formulae for Quantification of Curves, Surfaces and Solids and for Barycentres. (*Am. Jour. of Math.*, II).

PHYSICS.

BY PROFESSOR ROWLAND.

The Magnetic Effect of Electrical Convection. (*Am. Jour. of Science*, 1878; abstract by Helmholtz in *Monatsbericht d. Berlin Akad.*).

Research on the Absolute Unit of Electrical Resistance. (*Am. Jour. of Science*, 1878).

Note on the Theory of Electric Absorption. (*Am. Jour. of Math.*, 1878).

On Professor Ayrton and Perry's New Theory of the Earth's Magnetism, with a Note on a New Theory of the Aurora. (*Philos. Mag.*, 1879).

Note on the Magnetic Effect of Electrical Convection. (*Philos. Mag.*, 1879).

On the Diamagnetic Constants of Bismuth and Calc-Spar in Absolute Measure, part I. (*Am. Jour. of Science*, 1879).

On the Mechanical Equivalent of Heat, with Subsidiary Researches on the Variation of the Mercurial from the Air Thermometer, and on the Variation of the Specific Heat of Water. (*Amer. Acad., Boston, in press*).

BY DR. HASTINGS.

The Influence of Temperature on the Optical Constants of Glass. (*Am. Jour. of Science*, 1878).

On Lockyer's Hypothesis, that the so-called Elements are Compound Bodies. (*Am. Chem. Jour.*, 1879).

On the Perfect Color Correction in Triple Objectives. (*Am. Jour. of Science*, 1879).

BY DR. W. W. JACQUES.

Effect of the Motion of Air within an Auditorium upon its Acoustic Qualities. (*Jour. of Franklin Inst.*, 1878; *Philos. Mag.*, 1879).

Velocity of Very Loud Sounds. (*Am. Jour. of Science*, 1879; *Philos. Mag.*, 1879).

Diamagnetic Constants of Bismuth and Calc-Spar Crystals in Absolute Measure, part II. (*Am. Jour. of Science*, 1879).

Distribution of Heat in the Spectra of Various Sources of Radiation. (*Am. Acad., Boston*, 1879).

BY MR. E. H. HALL.

On a New Action of the Magnet on Electric Currents. (*Am. Jour. of Math.*, 1879).

CHEMISTRY.

1. Zur Kenntniss des Phosphoroxychlorids. By IRA REMSEN. (*Berichte der deutschen chemischen Gesellschaft*, 1876).

2. Ueber die Xylolsulfamide. By IRA REMSEN. (*Berichte, &c.*, 1877).

3. Ueber die Oxydation der Mesitylensäure. By IRA REMSEN and L. B. HALL. (*Berichte, &c.*, 1877).

4. Ueber die isomeren Sulfosäuren aus Paranitrotoluol. By IRA REMSEN and E. HART. (*Berichte, &c.*, 1877).

5. Ueber die Oxydation der Sulfosäuren des Metaxylols. (By IRA REMSEN and M. W. ILES. (*Berichte, &c.*, 1877).

6. Ueber Xylolsulfamide. By IRA REMSEN. (*Berichte, &c.*, 1878).

7. Ueber Chlorcymol aus Thymol u. s. w. By IRA REMSEN. (*Berichte, &c.*, 1878).

8. Nichtexistenz einer zweiten Dioxybenzoesäure aus Disulfobenzoesäure. By IRA REMSEN. (*Berichte, &c.*, 1878).

9. Oxydation der Xylolsulfosäuren. By IRA REMSEN and M. W. ILES. (*Berichte, &c.*, 1878).

10. Oxydation der Xylolsulfamide. By IRA REMSEN and M. W. ILES. (*Berichte, &c.*, 1878).

11. Neue Bildungsmethode der α -Oxyisophthalsäure. By IRA REMSEN and M. W. ILES. (*Berichte, &c.*, 1878).

12. Oxydation des Bromäthyltoluols und ähnlicher Substitutionsprodukte. By IRA REMSEN and H. N. MORSE. (*Berichte, &c.*, 1878).

13. Neue Methode zur quantitativen Bestimmung von Schwefel. By C. FAHLBERG and M. W. ILES. (*Berichte, &c., 1878*).
14. Neue Darstellungsmethode der Acetylamidophenole. By H. N. MORSE. (*Berichte, &c., 1878*).
15. Ueber die Oxydation des Orthotoluolsulfamids. By C. FAHLBERG and IRA REMSEN. (*Berichte, &c., 1879*).
16. On the Oxidation of Aromatic Substitution-products. By IRA REMSEN. (*Am. Chem. Jour., 1879*).
17. On the Oxidation of Xylenesulphamides. By IRA REMSEN and M. W. ILES. (*Am. Chem. Jour., 1879*).
18. On the Oxidation of Bromparaethyltoluene. By IRA REMSEN and H. N. MORSE. (*Am. Chem. Jour., 1879*).
19. An Apparatus for Gas Analysis. By A. V. E. YOUNG, (*Am. Chem. Jour., 1879*).
20. On the liquid Toluenesulphochloride. By C. FAHLBERG. (*Am. Chem. Jour., 1879*).
21. Ueber Oxydationsprodukte aus Xylolsulfamid. By L. B. HALL and IRA REMSEN. (*Berichte, &c., 1879*).
22. Ueber die Anhydrosulfaminisophtalsäure. By IRA REMSEN and R. D. COALE. (*Berichte, &c., 1879*).

This list does not include some addresses and semi-popular articles which have been published.

BIOLOGY.

1. The Effect of Stimulation on an Excised Nerve. By WILLIAM LEE, M. D. (*New York Medical Record*).
2. Report on the Hydroids of Alaska. By S. F. CLARKE. (*Scientific Results of Exploration of Alaska. Smithsonian Institution*).
3. *Normal Respiratory Movements of the Frog and the Influence upon its Respiratory Centre of Stimulation of the Optic Lobes. By H. N. MARTIN. (*Journal of Physiology, Vol. I, Nos. 2 and 3*).
4. *The Development and Regeneration of the Gastric Glandular Epithelium during Fœtal Life and after Birth. By HENRY SEWALL. (*Journal of Physiology, Vol. I, Nos. 4 and 5*).
5. Report on the Hydroids Collected in the Exploration of the Gulf Stream and the Gulf of Mexico. By S. F. CLARKE. (*Bull. Mus. Comp. Zool., Cambridge*).
6. On the Development of the Smelt. By H. J. RICE. (*Report Maryland Fish Commission, 1878*).
7. *The Influence of Stimulation of the Midbrain upon the Respiratory Rhythm of the Mammal. By H. NEWELL MARTIN and W. D. BOOKER, M. D.
8. *The Botanical Relations of Trichophyton Tonsurans. By I. EDMUNDSON ATKINSON, M. D. (*New York Medical Journal, Dec., 1878*).
9. *† Preliminary Observations on the Development of Marine Prosobranchiate Gasteropods. By W. K. BROOKS.
10. †The Larval Stages of Squilla Empusa. By W. K. BROOKS.
11. †The Development of Lingula and the Systematic Position of the Brachiopoda. By W. K. BROOKS.
12. On the Development of the Shad. By H. J. RICE. (*Report Maryland Fish Commission, 1878*).
13. On the Respiratory Function of the Internal Intercostal Muscles. By H. N. MARTIN and E. M. HARTWELL. (*Journal of Physiology, Vol. II, No. 1*).

14. Observations on the Physiology of the Spinal Cord. By ISAAC OTT, M. D. (*Journal of Physiology*, Vol. II, No 1).

15. On the Effect of Two Succeeding Stimuli upon Muscular Contraction. By HENRY SEWALL. (*Journal of Physiology*, Vol. II, No 2).

16. On the So-called Heat-Dyspnoea. By CHRISTIAN SIHLER, M. D. (*Journal of Physiology*, Vol. II, No. 3).

17. †List of animals found at Fort Wool. By P. R. UHLER.

Semi-popular articles are excluded from this list, which contains only papers based on original researches or observations made in the Laboratory of the University or its summer marine offshoot, the Chesapeake Zoölogical Laboratory. A considerable portion of the work of the session 1878-79 is not yet published.

*The papers marked with an asterisk were re-printed in a volume of "Studies from the Biological Laboratory, Session 1877-78," published by Murphy & Co., Baltimore. A similar volume for the session 1878-79 is nearly ready.

†The papers marked † were published in a volume containing the results of the work at the Marine Laboratory at Fort Wool in the summer of 1878. This volume also contained the following papers based on observations or collections made at the Summer Laboratory, but not written by members of the University—

Land Plants found at Fort Wool. N. B. Webster.

Lucifer typus. Walter Faxon.

PHILOLOGY.

BY PROFESSOR GILDERSLEEVE.

Justin Martyr. Apologies, and Epistle to Diognetus. Ed. with introduction and notes. N. Y., 1877.

On *ei* with the Future Indicative and *έάν* with the Subjunctive in the Tragic Poets. (*Amer. Philol. Assoc., Trans.*, 1876).

Personal Reminiscences of Friedrich Ritschl. (*Amer. Philol. Assoc., Proc.*, 1877).

Contributions to the History of the Articular Infinitive in Greek. (*Amer. Philol. Assoc., Trans.*, 1878).

Encroachments of *μῆ* upon *οῦ* in Later Greek. (*Am. Philol. Assoc., Proc.*, 1879).

Classics and Colleges. (*Princeton Review*, 1878).

University Work in America. (*Princeton Review*, 1879).

BY MR. H. C. G. BRANDT.

The Roman Alphabet in German. (*Amer. Philol. Assoc., Proc.*, 1878).

BY MR. A. S. COOK.

Studies in the Heliand. (*Amer. Philol. Assoc., Proc.*, 1879).

BY DR. C. R. LANMAN.

Noun-Inflection in the Veda. (*Am. Or. Soc., Jour.*, Vol. X, pp. 325-315).

Compendium of Sanskrit Paradigms. (1876).

A Conjectural Emendation of Rig-Veda i. 80. 11. (*Am. Or. Soc., Proc., 1877*).

On Tentative Linguistic Forms and their Significance for a Question of Linguistic Philosophy. (*Am. Or. Soc., Proc., 1878*).

BY MR. T. C. MURRAY.

The Home of the Shemitic Peoples. (*Am. Or. Soc., Proc., 1878*).

The Original Case-Form in Shemitic. (*Am. Or. Soc., Proc., 1878*).

Hebrew Synonyms (a book left in manuscript).

Lectures on the Poetical Books of the Old Testament. (*N. Y., 1879, in press.*)

BY MR. A. D. SAVAGE.

The "Oath of Rhadamanthus." (*Am. Philol. Assoc., Proc., 1878*).

BY DR. E. G. SIHLER.

The Historical Aspect of the Old Attic Comedy. (*Am. Philol. Assoc., Proc., 1876*).

On Herodotus's and Æschylus's Accounts of the Battle of Salamis. (*Am. Philol. Assoc., Trans., 1877*).

The Rhetorical and Critical Labors of Dionysius of Halicarnassus. (*Am. Philol. Assoc., Proc., 1879*).

HISTORY AND POLITICAL SCIENCE.

BY DR. H. C. ADAMS.

Zur Geschichte der Besteuerung in den Vereinigten Staaten von Amerika in der Periode 1789-1816. (*Zeitsch. f. d. gesam. Staatswissenschaft, Tübingen, 1879*).

Cooperation. (*Am. Soc. Sc. Assoc., 1878*).

Historical Position of Socialism in the Development of Political Economy. (*Penn. Monthly, 1879*).

BY DR. H. B. ADAMS.

Maryland's Influence in Founding a National Commonwealth, or the History of the Accession of Public Lands by the Old Confederation. (*Maryland Hist. Soc., 1877*).

The foregoing lists do not include the papers of any writer published previous to his connection with this institution, or after he left it; and it omits light articles and those of a merely transient interest. It does not include the papers of non-resident lecturers.

G.

List of Donors to the Library, September 1, 1878, to September 1, 1879.

AMERICAN INSTITUTE OF MINING ENGINEERS. Transactions. Phila. and Easton, Pa. 1871-8. 6 vols. O.

B. BONCOMPAGNI, (through Professor Sylvester.) Bollettino di Bibliografia e di Storia delle Scienze Matematiche e Fisiche. Roma, 1868-78. 11 vols. F.

- CENTENNIAL BOARD OF FINANCE. Report of the International Exhibition, 1876. Phila., 1878-9. 11 vols. O.
- Prof. A. JAY DU BOIS, Ph. D. (The Translator.) *Mechanics of Engineering*, by J. Weisbach. Vol. 2d. New York, 1878. O.
- Prof. E. FRANKLAND, F. R. S. (The Author.) *Experimental Researches in Pure, Applied, and Physical Chemistry*. London, 1877. O.
- Hon. JOHN W. GARRETT. *Elements and Manual of Botany*, by John Hutton Balfour. Edinburgh, 1875-6. 2 vols. D.
- Guide to Royal Botanic Gardens, Edinburgh, by John Hutton Balfour. Edinburgh. D.
- Open Air Vegetation, by James McNab. Edinburgh, 1876-7. 2 vols. O.
- GEORGE L. HARRISON. (The Author.) *Social Science in relation to State Charities*. Phila., 1877. O.
- Prof. JAMES A. HARRISON. (The Author.) *Greek Vignettes*. Boston, 1878. S.
- Gen. A. A. HUMPHREYS, Chief of Engineers, U. S. A. *U. S. Geological Exploration of 40th Parallel*. Vol. I.
- Systematic Geology*, by Clarence King. Washington, 1877. Q.
- Annual Report of the Chief of Engineers to the Secretary of War, for 1878*. Washington, 1879. 3 vols. Q.
- Hon. JOHN JAY KNOX. *Annual Reports of the Comptroller of the Currency*. Washington, 1876-8. 2 vols. O.
- Hon. F. C. LATROBE, Mayor of Baltimore. *Mayor's Message and Reports of the City Officers, for the year 1878*. Baltimore, 1879. 2 vols. O.
- Hon. GEORGE H. MOORE, LL. D. (The Author.) *Notes on the History of Slavery in Massachusetts*. New York, 1866. O.
- Treason of Maj. Gen'l Charles Lee. New York, 1860. O.
- Mrs. CHARLES PICKERING. *Chronological History of Plants*, by Charles Pickering, M. D. Boston, 1879. Q.
- Mrs. BURR PORTER. (In continuance of former gifts commemorative of P. Porter Poinier, a Fellow of this University.) *Théorie Mécanique de la Chaleur*, par R. Clausius, trad. de l'allemand par F. Folie. Paris, 1868-9. 2 vols. D.
- Recent Discussions in Science, Philosophy and Morals*, by Herbert Spencer. New York, 1871. O.
- Treatise on Magnetism*, by George Biddell Airy. London, 1870. D.
- Expériences sur les Machines à Vapeur*, par M. V. Regnault. Paris, 1847-70. 3 vols. Q.
- Mécanique Analytique*, par J. L. La Grange, rev. par M. J. Bertrand. Paris, 1853. Q.
- Théorie Mathématique de la Chaleur*, par S. D. Poisson. Paris, 1835. Q.
- Treatise on the Steam Engine in its various applications*, by John Bourne. 9th ed. New York, 1872. Q.
- Rear Admiral JOHN RODGERS, U. S. N. *Astronomical and Meteorological Observations made at the U. S. Naval Observatory, Washington*. Washington, 1847-78. 27 vols. Q.
- SMITHSONIAN INSTITUTION. *Miscellaneous Collections*. Washington, 1862-78. 6 vols. O.
- Documents Relative to its Origin and History*, ed. by W. J. Rhees. Washington, 1879. O.
- Mrs. JARED SPARKS. *Notes on the State of Virginia*, by Thomas Jefferson. Philadelphia, 1825. O.
- UNITED STATES DEPARTMENT OF THE INTERIOR. *U. S. Geological and Geographical Survey of the Territories*. Washington. 35 vols. Q. and O.
- UNITED STATES WAR DEPARTMENT. *History of the War Department of the United States*, by L. D. Ingersoll. Washington, 1879. O.

ADDITIONAL GIFTS OF BOOKS AND PAMPHLETS HAVE BEEN RECEIVED
AS FOLLOWS:

From American Institute of Mining Engineers, (7); Boston Public Library, (1); S. C. Donaldson, (3); Hon. John W. Dwinelle, (2); George J. Engelmann, (5); Simon H. Gage, (1); Samuel Garner, (1); President D. C. Gilman, (1); W. B. Hayward, (1); Prof. Edward Hitchcock, (1); Gen. A. A. Humphreys, (1); University of Christiania, (8); John W. M. Lee, (4); Herbert Masson, (1); John Murphy & Co., (2); Prof. M. A. Newell, (1); Royal Society of New South Wales, (5); Christian Sihler, (2); Ernest G. Sihler, (7); Smithsonian Institution, (19); Prof. J. J. Sylvester, (2); E. P. Tenney, (1); Samuel Theobald, (2); H. H. Toland, (1); U. S. Department of the Interior, (39); U. S. Navy Department, (1); U. S. War Department, (2).

The following Scientific Periodicals are issued, at stated intervals, under the auspices of the University:

- I. American Journal of Mathematics. (Prof. J. J. SYLVESTER, Editor in Chief; Dr. W. E. STORY, Editor in Charge.) Quarto. Four numbers make a volume. Vol. I, 1878-79, (388 pp., 4 plates;) Vol. II, 1879-80. Subscription price, per vol., \$5.00, price per number, \$1.50.
 - II. American Chemical Journal. (Prof. IRA REMSEN, Editor.) Six numbers make a volume. Vol. I, 1879-80. Subscription price, per vol., \$3.00; price per number, 50 cents.
 - III. Studies from the Biological Laboratory. (Prof. H. N. MARTIN, Editor.) No. 1, 1879, (91 pp., 4 plates;) No. 2, (in preparation.) Price per number, \$1.00.
 - IV. Scientific Results of the Chesapeake Zoölogical Laboratory. (Dr. W. K. BROOKS, Editor.) Session of 1878, (170 pp., 13 plates;) Session of 1879, (in preparation.)
 - V. American Journal of Philology. (Prof. B. L. GILDERSLEEVE, Editor.) (Four numbers, make a volume.) Number 1, (in press.) Subscription price, \$3.00 per volume.
-

The Official Publications of the University, are as follows:

1. A REGISTER giving a list of the officers, academic staff and students, stating generally the nature and amount of the instruction given and work actually done or in progress during the *current* year, and exhibiting in detail the scheme and regulations of the University.
2. A PROGRAMME, issued in the early summer, announcing the classes, lectures and work proposed for the *ensuing* year.
3. An ANNUAL REPORT presented by the President to the Board of Trustees, reviewing the operations of the University during the *past* academic year.

7-8 378.73 J65
17018

FIFTH ANNUAL REPORT

OF THE

JOHNS HOPKINS UNIVERSITY,

Baltimore, Maryland.

1880.

FIFTH ANNUAL REPORT

OF THE

Johns Hopkins University,

Baltimore, Maryland,

1880.

BALTIMORE:
PRINTED BY JOHN MURPHY & Co.
182 BALTIMORE STREET.
1880.

TRUSTEES.

1879-80.

President.

GALLOWAY CHESTON.

Treasurer.

FRANCIS WHITE.

Secretary.

WILLIAM HOPKINS.

Members of the Board.

GEORGE WILLIAM BROWN,	WILLIAM HOPKINS,
GALLOWAY CHESTON,	REVERDY JOHNSON,
GEORGE W. DOBBIN,	FRANCIS T. KING,
JOHN W. GARRETT,	C. MORTON STEWART,
CHARLES J. M. GWINN,	JAMES CAREY THOMAS,
LEWIS N. HOPKINS,	FRANCIS WHITE.

COMMITTEES.

1879-80.

Executive Committee:

GEORGE WILLIAM BROWN,	CHARLES J. M. GWINN,
GEORGE W. DOBBIN,	C. MORTON STEWART,
JAMES CAREY THOMAS,	GALLOWAY CHESTON, <i>ex officio</i> .

Finance Committee:

JOHN W. GARRETT,	FRANCIS WHITE,
GALLOWAY CHESTON, <i>ex officio</i> .	

Building Committee:

GEORGE W. DOBBIN,	FRANCIS T. KING,
LEWIS N. HOPKINS,	REVERDY JOHNSON,
GALLOWAY CHESTON, <i>ex officio</i> .	

Committee in Charge of the Clifton Grounds:

REVERDY JOHNSON,	FRANCIS WHITE,
GALLOWAY CHESTON, <i>ex officio</i> .	

FIFTH ANNUAL REPORT

OF

THE PRESIDENT.

*To the Trustees of the
Johns Hopkins University:*

GENTLEMEN :

In presenting to you the Fifth Annual Report of our University, it is necessary to bear in mind that printed copies of it are likely to fall into the hands of those who may not have seen the preceding issues and I therefore ask leave to go over the experience of previous years as I bring before you an account of the year just closed.

We have now concluded the first four years of instruction in the Johns Hopkins University. Within this period 295 persons have been enrolled among us as students, including graduate, undergraduate and special students,—but not including the attendants upon public lectures, or upon the courses designed exclusively for teachers, and for members of the medical profession. The under-

graduate students have come chiefly from Baltimore and its neighborhood. The graduate and special students have come from almost every State in the Union,—and to a very limited extent from beyond its borders. Of these, 165 had taken an academic degree before coming to us.

The following table shows the attendance, in each of the past four years:

1876-77,	89,	of whom	54	were	graduates,	35	not	graduated.
1877-78,	104,	"	58	"	"	46	"	"
1878-79,	123,	"	68	"	"	60	"	"
1879-80,	159,	"	79	"	"	80	"	"

A.

RECAPITULATION OF FORMER STATEMENTS.

Among the special features apparent in our plans it may be worth while to recapitulate the following:

1. *The Faculty of Philosophy.* Literature and science have been encouraged with equal heartiness. While on the one hand we have endeavored to promote original researches in Mathematics, Physics, Chemistry, and Biology, we have also made liberal provision for the study of the philological and historical sciences.

We have carefully avoided all tendencies toward the formation of a scientific faculty, department, or school, face to face with a classical or literary department,—and have aimed to regard all the branches of learning which have here been taught

as properly coördinated in one department of Philosophy and the Arts. Although much thought has been given to professional instruction, particularly in Medicine, no steps have as yet been taken in that direction.

So far as the scholars are concerned, the effort has been made to impress upon them all, that the theory of liberal education requires that every one who expects to follow scientific pursuits should supplement his special studies with a good training in the use of language,—and in addition to a knowledge of his own tongue, should become acquainted with Latin, and with two or more of the modern languages of Europe; and likewise that every one who expects to engage in a literary calling should be familiar with the methods which are followed and the reasoning which is employed in the prosecution of modern science. Accordingly in every scheme of study which we have proposed, and in every examination for a degree, we have insisted that both literature and science should be included. The careful study of our announcements will show this aim; while with an increasing staff and with enlarged experience we may hope in the future to be even more successful than we have been in the past.

2. *The Advancement and Publication of Researches.* We believe that it is one of the noblest

duties of a University to advance knowledge, and to diffuse it not merely among those who can attend the daily lectures of the professors, but far and wide. Consequently, in the selection of instructors,—the younger as well as the older,—we have endeavored to choose those who may still be students while they are teachers, investigators in their several departments of learning, disposed to add their contributions to the sciences they profess to teach. We have not only selected those who are capable of carrying forward researches, but we have endeavored to keep them so free from the petty interruptions of an ordinary academic life and from its excessive burdens that they have had time at their command for the prosecution of study. Liberal provision has been made of apparatus and instruments, of books and journals, new and old,—so that the work here performed may be quite in harmony with the investigations which are carried on in older institutions and in other lands. Publication has been encouraged,—so far as possible through the channels already established,—but when necessary through agencies of our own. We have not instituted a university press,—but we have made arrangements for the systematic printing of mathematical, chemical, biological and philological papers, and in a less formal way for the announcement in our circulars of the work which

is done in all the university departments. We have hoped in this way to extend the usefulness of this foundation far beyond the company of those whom we constantly instruct.

3. *University Students.* We have been aware that there are large numbers of young men in this country who desire to carry on their education beyond what are commonly known as the collegiate or academic courses, without at once entering upon the study of the learned professions; and we have arranged our courses so that all who enter our walls for this purpose, may have ample assistance and encouragement adapted to their personal requirements. Many of these advanced students desire to become professors and teachers, and a very considerable number have already gone out from among us to positions of honor and usefulness in other institutions of learning,—so that in this aspect, our foundation may be regarded as a seminary of teachers. Others are training themselves for scientific callings which are practical rather than academic, demanding the most exact knowledge and the most skilful methods. Some who had already entered upon professional life, have come to us to fill up such deficiencies in their training as we are able to supply. The number of physicians, for example, who have shown a desire to become acquainted with the modern methods of physiological inquiry as taught in our laboratory, is

quite large,—and so the number of clergymen who have come to us for instruction in languages, is noteworthy. Another group of students consists of young men of wealth and social standing, who are not inclined to follow professional life,—but who are earnestly pursuing advanced and difficult courses of study, that they may be well prepared to do their part, whatever may be the position as writers, speakers, teachers, or leaders in public affairs hereafter open to them.

From these various classes we have formed a company consisting last year of seventy scholars, who had already taken an academic degree, a company large enough to exhibit great diversities of talent, training, and aspiration, and also to afford companionship in study to men whose pursuits are very special. The requirements of such students have constantly been thought of in the development of our plans, and as the attractions which Baltimore is able to offer, not only within our walls, but in the other literary and scientific foundations of the city, become better known, we look for a constant, if not a rapid, accession to their numbers.

4. *Collegiate Students.* We have thought from the outset, that the youth of Baltimore and the adjacent region, had peculiar claims upon this University,—for our founder was a Baltimore merchant who gave his fortune to build up in

this place the institutions of charity and of education. His gifts were too generous to be restricted by any geographical consideration and they are administered in a most liberal spirit; at the same time it would not be reasonable that the boys of Baltimore should be obliged to go away from the city of their residence in order to secure the requisite preparation for university work. It would indeed be an excellent thing if some liberal citizen would found a college or hall in connection with this University, to bear his own name, and to afford on a liberal plan, under appropriate regulations, collegiate education. A kindred foundation for the education of young women is also much to be desired. But for the present, it is possible for the Johns Hopkins University, by the addition of a few teachers, to provide collegiate courses leading to the degree of Bachelor of Arts; and in most respects to do quite as much for those who enter upon these courses as is done in any college for students of like standing. Some of the peculiar advantages of the collegiate part of our work may be discovered by a scrutiny of our registers and programmes.

5. *Public Lectures.* Our work has been prosecuted not only by the instruction of young men, and by the publication of scientific papers, but by courses of lectures annually given in Hopkins

Hall to which the educated public are admitted, with only the limitations which the capacity of the hall imposes. A great variety of scientific, literary, historical and philosophical themes have been discussed in these lectures by the members of our own academic staff, and by other gentlemen of distinction from a distance. Several series of Saturday lessons designed exclusively for teachers have also been given, and special courses in physiology have been offered to medical students connected with the professional schools in Baltimore. Among incidental services may be mentioned the delivery of popular addresses on literary and scientific themes before audiences brought together in Canton and other suburban districts, somewhat after the plan of penny-readings which are so useful in England. By responding to calls for these and kindred services, in different parts of the city, the members of the University have shewn their readiness to contribute to the general intellectual enjoyment and progress of the community.

6. *Bestowal of Degrees.* While we have endeavored to extend the influence and even the instructions of the University to a wide circle, we have determined to bestow our honors with a very careful hand. The standard of matriculation has been placed at a higher point than is common in the institutions of this country;

the examinations for admission and promotion have been carefully conducted and accurately recorded; to a very considerable extent in undergraduate classes, two papers have been set, one by the teacher of the class, and the other by an independent examiner; in the final tests for the degree of Doctor of Philosophy, scholars who are experienced in teaching and who are connected with other institutions of learning, have often lent their aid in the careful scrutiny of the graduating theses, and sometimes in the oral examination of the candidates. We have conferred one honorary degree.

7. Books and Apparatus. The purchase of books and apparatus has been permitted upon a liberal scale, and in accordance with the requests which have been preferred by the principal workers in the various departments. Our collections are to be judged not so much by their extent as by their adaptation to our needs. The list of instruments designed for exact measurements was printed in our last report, and since that time important additions have been made. The amount already expended for books and periodicals is \$26,081.71 and for apparatus, \$32,151.01.

B.

RESULTS OF THE FOURTH YEAR.

GENERAL STATEMENTS.

From this general review of the considerations by which we have been governed, I proceed to bring before you some figures which may shew our circumstances at the close of a fourth year.

In the annual session, lately brought to a close, there have been no radical changes. We can look back upon another period of satisfactory progress, free from any interruption of the harmony, order, and devotion to study which have hitherto marked our associated life. We are encouraged to believe that the methods of academic work here followed are approved by many of the most enlightened teachers of this and other lands. Every year brings within our doors a large number of officers of colleges and universities who are interested in this foundation, and the call for our circulars and reports comes from widely separated States and countries. The professors and associates of the University continue to set the example of devotion to the discovery and diffusion of knowledge, and they have never been more successful than within the past year. The corps of Fellows maintains its high character, and includes as heretofore a score of

well trained scholars, nearly or quite ready to enter upon positions of usefulness in literary and scientific institutions. About one-half of our students continue to come from the State of Maryland and the other half are drawn from the other States of the Union, with a slowly increasing number from the South and West, and with a small accession from countries beyond the territory of the United States. Not far from one-half of those enrolled upon our lists have already been admitted to academic degrees,—most of the remainder are candidates for the degree of B. A., while a few have been received as special students, without reference to graduation. The scientific and literary courses which we offer, appear to be taken with equal avidity. The conduct of the students has been without reproach,—not a single member of the University having been censured for disorder since our doors were opened. There is an increasing desire to win the honor of an academic degree and we graduated the last year sixteen Bachelors of Arts, and five Doctors of Philosophy. The afternoon lectures continue to draw large companies of hearers. The scientific publications of the University have been increased by the publication of a Journal of Philology. The printing in occasional quarto numbers of our official circulars has been commenced, and six numbers were issued within the last year.

PERSONAL CHANGES.

The staff of Instructors was augmented at the beginning of the year by the appointment of Professor Charles S. Peirce, of the U. S. Coast and Geodetic Survey, to be a Lecturer on Logic, and of Mr. Sidney Lanier to be a Lecturer on English Literature. Mr. Alexander Graham Bell, to whom the Volta Prize has been awarded by the French government for his discoveries, has accepted an invitation to join our staff as a Lecturer on Phonology. Professor J. Willard Gibbs has delivered a course of lectures on Rational Mechanics, to advanced students in Mathematics. Dr. Thomas Craig, of the U. S. Coast and Geodetic Survey, has continued to lecture on certain mathematical subjects, and Dr. H. C. Adams has given and will give instruction in Political Economy. Professor G. S. Morris continues to lecture on the History of Philosophy and on Ethics,—and Professor Diman of Brown University has consented to lecture again during the coming winter. A short course on the Philosophy of Physics was given by Professor John Trowbridge.

The corps of Associates has been increased by the appointment of Dr. Minton Warren, in Latin, and of Mr. A. S. Cook in English,—both of whom have rendered efficient services during the past year. Dr. Wm. Hand Browne entered upon the office of Librarian at the beginning of the session,

and discharges the duties with ability and fidelity. Dr. H. Sewall, formerly a Fellow and an Assistant in Biology, has returned to this country after a period of study in European laboratories, and now takes the place of an Associate in Biology. Dr. C. R. Lanman, who entered the University as a Fellow in 1876 and was for the past three years an Associate, has accepted a call to the professorship of Sanskrit in Harvard University and leaves us with the respect and good will of all who have known his talents and learning. Dr. L. B. Hall, Assistant in Chemistry, has been called to the professorship of Chemistry and Physics at Haverford College, and now enters upon the duties of his new position simultaneously with Dr. Allinson, who goes to the chair of Greek. Mr. W. T. Sedgwick, lately a Fellow, has been made an Assistant in Biology, and Dr. E. H. Hall, also a Fellow for the last two years, becomes an Assistant in Physics. Mr. Stockbridge, lately an instructor in Amherst College, joins us as a teacher of Latin and German.

ATTENDANCE.

The attendance during the year 1879-80, was as follows :

Enrolled Students.

Fellows,	20
Other Graduates,	59
Matriculates,	82
Non-Matriculates,	48

159

Unenrolled Students.

Teachers Class in Early English,	20
Teachers Class in Theory of Numbers,	24
Medical Students, in Animal Physiology,	16
Medical Students, in Microscopic Anatomy,	4
Chesapeake Zoölogical Laboratory in 1879,	10
Chesapeake Zoölogical Laboratory in 1880,	6
Sea Side Class (at Fort Wool, Va.) in 1880,	8
Special, in History,	6
Special, in New Testament Greek,	5

Average Attendance upon Public Lectures :

English Verse,	170
French Epic Poetry,	57
Biology,	78
Philosophy of Physics,	142
Italian Renaissance,	212
The Vedas,	151
Greek Tragic Poets,	114
History of Philosophy,	123
French Literature,	47
National Debts,	41

CLASSES, SOCIETIES, LABORATORIES, AND PUBLICATIONS.

From various statements which are printed in the Appendix, the character of the instruction which has been given during the past year, as well as some idea of the lines of investigation which have been followed by many of the members of the academic staff, may be clearly ascertained. It will be seen that during the year classes have been organized and taught in the following branches of science:

MATHEMATICS :

Theory of Numbers,	Quaternions,
Elliptic Functions,	Higher Plane Curves,
Solid Analytic Geometry,	Differential Equations,
Calculus of Variations,	Spherical Harmonics,
Cylindric or Bessel's Functions,	General Theory of Functions,
Differential and Integral Calculus,	Conic Sections,
Theory of Equations.	

PHYSICS :

Thermodynamics,
Theory of Heat Conduction,
General Physics.

Electricity and Magnetism,
Rational Mechanics,

CHEMISTRY :

Organic Chemistry,
General Chemistry.

Analytical Chemistry,

BIOLOGY :

Animal Physiology,
Osteology, Human and Com-
parative,
General Biology.

Animal Morphology,
Histology,

The Laboratories of the University are three in number, and are open during the academic year from September to June, with the exception of a few holidays. They are devoted to Chemistry, Physics, and Biology.

During the warm months a zoölogical station is maintained on the sea-board under the name of the "Chesapeake Zoölogical Laboratory." This was stationed on the Chesapeake in the summer of 1878, and again in 1879, and has been maintained during the recent academic year at Beaufort, N. C., south of Cape Hatteras. Dr. W. K. Brooks has continued to be the director, and the results of his able researches, and those of his coödjutors, will be printed. One of the Fellows in Biology, Mr. E. B. Wilson, was with him during the entire season; another one of our Fellows, Mr. Mitsukuri, and three other scientific collaborators were there for a considerable period. A

statement of the reasons for selecting Beaufort as a station and many details in respect to the observations which have been made during the season will be found in a communication by Dr. Brooks appended to this report.

The distance of Beaufort from Baltimore was so great that only a few persons availed themselves of the facilities there afforded. Partly on this account, and partly to meet the requirements of beginners in sea-side studies, Dr. S. F. Clarke, at first on his own responsibility, but afterwards with the pecuniary assistance of the University, volunteered to guide the work of an elementary class at Fort Wool, the site at the mouth of the Chesapeake, where, for two previous seasons, the Chesapeake Laboratory had been stationed. Permission to use the government buildings at that station was accorded by the Secretary of War, on the recommendation of Gen. Q. A. Gillmore, U. S. A., to whom again the thanks of the University are due. The number of scholars in attendance was seven.

The class instruction in language, history, and philosophy pertained to the following authors and subjects:

SANSKRIT :

Rig and Atharva Vedas,

Advanced and Elementary Classes.

GREEK :

Pindar,
Greek Lyric Poetry,

Aristophanes,
Aristotle, *Rhetoric*,

GREEK : (*Continued.*)

Plato, <i>Gorgias</i> ; <i>Meno</i> ,	Homer, <i>Odyssey</i> ,
Lysias, <i>four orations</i> ,	Isocrates, <i>two orations</i> ,
Select Readings in the Tragedies,	New Testament,
Composition and Translation,	Syntax.

LATIN :

Plautus,	Terence, <i>two plays</i> ,
Lucretius, <i>three books</i> ,	Horace,
Livy, <i>two books</i> ,	Latin Prose Composition,
Historical Latin Grammar.	

TEUTONIC LANGUAGES, (including German and English) :

Gothic, <i>Ulfila</i> ,	Old Saxon, <i>Heliand</i> ,
Middle High German, <i>Nibelungenlied</i> , etc.	Anglo Saxon, <i>two classes</i> ,
Ballads, <i>Lectures</i> ,	Anglo Saxon Laws,
Goethe, <i>Faust</i> ,	Early English,
Lessing, <i>Nathan der Weise</i> ,	Chaucer,
Humboldt, <i>Ansichten der Natur</i> ,	Shakespeare, <i>two classes</i> ,
Schiller, etc.,	Exercises in writing.

ROMANCE LANGUAGES, (including French, etc).

Provençal,	Wallachian,
Old French, <i>Chanson de Roland</i> , <i>Villehardoin</i> , etc.	Modern literary and scientific authors.

HISTORY AND POLITICAL SCIENCE :

Modern History, <i>Renaissance and Reformation</i> ,	Comparative Constitutional History,
English Constitutional History,	Political Economy,
<i>Stubbs' Charters</i> ,	Special Course in Money and Banking.

LOGIC :

Mediaeval Logic,	Mathematical Logic,
Probabilities,	Mill's Logic.

HISTORY OF PHILOSOPHY :

British Philosophy,	Ethics,
German Writers on Aesthetics.	

Classes have also been taught in Physiography, Drawing, Elocution, etc.

Public lectures have been given during the year in Hopkins Hall, as follows : *

*Two of these courses—those by Mr. Lanier and by Professor G. S. Morris,—have been printed. M. Rabillon lectured in French.

Subject.	Lecturer.	Average Attendance.
English Verse, (16),	Sidney Lanier,	170
French Epic Poetry, (12),	L. Rabillon,	57
Readings in Corneille, Molière, etc., (12,)	L. Rabillon,	47
Philosophy of Physics, (12),	John Trowbridge,	142
Italian Renaissance, (10),	H. B. Adams,	212
The Vedas, (6),	C. R. Lanman,	151
Greek Tragic Poets, (9),	B. L. Gildersleeve,	114
British Thought and Thinkers, (12),	G. S. Morris,	128
Recent Studies of the Crab and Oyster, (8),	W. K. Brooks,	78
On National Debts, (9),	H. O. Adams,	41

For the guidance of advanced students various plans differing both from lectures and classes have been employed. In Greek, Professor Gildersleeve maintains a seminary akin to those of the German universities, which has met twice a week during the last year, and has been chiefly devoted to the study of Aristophanes. The special students in Mathematics meet once a month under the direction of Professor Sylvester and Dr. Story, for the presentation and discussion of mathematical papers. Dr. Hastings has met a class in Physics every Saturday, for the discussion of problems, and the criticism of results. There are three companies which have held weekly meetings for the reading of scientific journals,—Chemical, Physical, and Biological.

Five associations have met frequently for the presentation of scientific and literary papers. Abstracts of some of the more important contributions have been given in the University Circulars.

These societies are :

1. The Scientific Association, meeting under the presidency of Professor SYLVESTER.
2. The Philological Association, meeting under the presidency of Professor GILDERSLEEVE.
3. The Historical Association of which Dr. H. B. ADAMS is the secretary.
4. The Metaphysical Club of which Professor C. S. PEIRCE, is the head.
5. A Naturalists' Field Club, organized under the leadership of Professor MARTIN.

Four scientific journals are published under the auspices of the University. Their principal contents are stated in the Appendix.

1. The American Journal of Mathematics, published quarterly under the editorial control of Professor SYLVESTER, with the aid of Dr. STORY. Nine numbers have been printed, and two numbers are nearly ready.
2. The American Chemical Journal, published six times in the year, under the editorial control of Professor REMSEN. The second volume is nearly complete.
3. The American Journal of Philology, edited by Professor GILDERSLEEVE, the publication in his temporary absence having been supervised by Professor C. D. MORRIS. Three numbers have appeared, and the fourth is in press.
4. The Studies from the Biological Laboratory, partly printed here for the first time, and partly contributed to the Cambridge Journal of Physiology, have been collected in one octavo volume of 500 pages, with 40 plates. The editorial supervision was in the hands of Professor MARTIN, with the coöperation of Dr. W. K. BROOKS.

COMMEMORATION DAY ; DEGREES BESTOWED.

The twenty-third of February, 1880, was observed as our fifth commemoration day. After opening statements on the part of the Faculty and the Trustees, candidates for the degree of Bachelor of Arts were presented by Professor C. D. MORRIS ; and a candidate for the degree of Doctor of Philosophy was presented by Professor Sylves-

ter. Hon. C. J. M. Gwinn, on behalf of the Trustees and the Faculty, presented Mr. H. A. Rowland, Professor of Physics, and the degree of Doctor of Philosophy, *honoris causa*, was conferred upon him for his attainments in Physics, and especially for the learning and ability evinced in his recent study of the problem of the Mechanical Equivalent of Heat.

An original ode was also read by Mr. Sidney Lanier, and a brief congratulatory address was delivered by Hon. William M. Evarts, LL. D., Secretary of State. A social assembly, which was attended by several hundred ladies and gentlemen, concluded the exercises.

At the close of the academic year, June 9, 1880, degrees were conferred upon another company of young men who had then completed their examinations. The complete list of graduates for the year is as follows:

DOCTORS OF PHILOSOPHY.

1. FRANCIS GREENLEAF ALLINSON, of New Jersey, who was graduated in Haverford College in 1876, in Harvard University in 1877, and received his degree as Master of Arts at Haverford College in 1879. He has been for three years a student and Fellow of this University, and has passed examinations in Greek, in Latin, and in Sanskrit. He presented a thesis, "On Ionic Forms in the Second Century, A. D., and the obligations of Lucian to Herodotus."

2. FABIAN FRANKLIN, of Baltimore, a graduate in 1869, of Columbian University, Washington, where he received the degree of Ph. B. He has been successively a Graduate Student, a Fellow and a Teacher in this University since 1876. His studies were in Mathematics and Physics. His thesis on "Bipunctual Co-ordinates" has been printed in the *American Journal of Mathematics*.

3. EDWIN HERBERT HALL, of Maine, who received his first degree in Bowdoin College in 1875, and has been a student in this University for three years. He has held the position of Fellow in Physics for two years. He has passed examinations in Physics and in Chemistry. His thesis, entitled "On the New Action of Magnetism on a Permanent Electric Current," is printed in the *American Journal of Science*.

4. ALLAN MARQUAND, of New York City, who was graduated in Princeton College in 1874, and has been a Fellow in this University for two years. He has passed examinations in Logic and in the History of Ethics. His thesis upon "The Logic of the Epicureans," with a translation of a treatise of Philodemus—*περὶ σημείων καὶ σημειώσεων*, is to be printed.

5. WASHINGTON IRVING STRINGHAM, of Kansas, who was graduated in Harvard University in 1877. He came to this University three years ago, and has been a Fellow for two years. He has passed examinations in Quaternions, Determinants, Elliptic Functions and other branches of Mathematics and in Logic. His thesis, "On Regular Figures in n -Dimensional Space," is printed in the *American Journal of Mathematics*.

BACHELORS OF ARTS.

1. THOMAS MILTON BEADENKOFF, of Baltimore, who was graduated at the City College in 1871, and has finished major courses in Greek and Latin, and minor courses in Physics, History and German.

2. ALLEN KERR BOND, of Harford County, Maryland, who received his previous training at Mr. G. G. Carey's School, Baltimore, and has here pursued major courses in Biology and Chemistry, and minor courses in German, Latin and Physics.

3. WILLIAM CATHCART DAY, of Baltimore, a former student at the City College, who has followed major courses in Chemistry and German, and minor courses in French, Mathematics and Physics.

4. HENRY LAURENCE GANTT, of Owings Mills, Maryland, who received his previous training in the McDonogh School, and has finished major courses in Mathematics and Physics, and minor courses in French, German and Philosophy.

5. EDGAR GOODMAN, of Baltimore, who graduated at the City College in 1875, and has finished major courses in Latin and History, and minor courses in German, French and Physics.

6. CARL ECKHARDT GRAMMER, of Baltimore, a former student of the City College, who has here pursued major courses in Greek and Latin, and minor courses in History, German and Chemistry.

7. ALEXANDER FRIDGE JAMIESON, of Virginia, who was graduated at the Phillips Academy, Exeter, in 1875, and has completed major courses in Greek and Latin, and minor courses in German, History and Physics.

8. EDMUND ALLEN JARVIS, of Baltimore, who received his previous training at Mr. G. G. Carey's School, Baltimore, and has followed major

courses in Chemistry and Biology, and minor courses in Latin, Greek and German.

9. STEWART BRIAN LINTHICUM, of Baltimore, a former student of Mr. G. G. Carey's School, who has finished major courses in Latin and German, and minor courses in Chemistry, French and History.

10. JOHN HANSON LOWE, of Baltimore, a former student of the City College, who has pursued major courses in Latin and History, and minor courses in German, French and Physics.

11. LEIGH CLINTON MORGAN, of Baltimore, who graduated at the City College in 1875, and has pursued major courses in Greek and Latin, and minor courses in Philosophy, German and Physics.

12. NELSON PALMER, of Baltimore, who received his previous training at Mr. G. G. Carey's School, and has here pursued major courses in Latin and German, and minor courses in History, French and Chemistry.

13. THOMAS PETTIGREW, of North Carolina, a former student at the Hillsboro' (N. C.) Military Academy, who has finished major courses in German and Latin, and minor courses in Physics, French and Mathematics.

14. HARRY FIELDING REID, of Baltimore, who graduated at the Pennsylvania Military Academy in 1876, and has followed major courses in Mathematics and Chemistry, and minor courses in Physics, German and Latin.

15. WILTZ RAYMOND STRICKLEN, of Baltimore, who graduated at the City College in 1876, and has completed major courses in Greek and Latin, and minor courses in German, Physics and History.

16. LEWIS WEBB WILHELM, of Baltimore, who graduated at the City College in 1871, and has taken major courses in German and Mathematics, and minor courses in Physics, French and History.

Degrees were conferred upon four of those above named on the Commemoration Day, February 23, 1880, and upon the others, June 9, 1880.

THE LIBRARY.

The University library continues to make a steady advance and now numbers nearly 9000 bound volumes of which 1363 have been added within a year. The collection of encyclopædias, dictionaries, gazetteers, and other books of reference is very complete, and the great writers of the world are well represented in the best modern editions. This was the nucleus of the library. Of

late, by the liberality of the Trustees, the special wants of different departments of instruction and research have been studied, and to some extent supplied. In classical and modern philology, large purchases have been made and the sciences of biology, physics, etc., have not been neglected. The Chemical Laboratory was opened with a full series of chemical journals which have been kept up without interruption. On the tables of the reading room may be found the most important periodicals of Europe and America. The number received is 256. Occasionally, we have asked for the loan of books from libraries at a distance, and the requests have been granted with a readiness which shows how widely the Librarians of the country accept the doctrine that "a book is never so valuable as when it is in use."

SCHOLARSHIPS.

Somewhat more than a year ago, the need of a system of graduate scholarships was so apparent to the President and Professors that they contributed the sum of \$500, as the beginning of such a foundation. One of the Fellows generously gave for a like purpose the sum of \$250, to which one of the Trustees added the sum of \$100. Recently the Board has appropriated for the same object the sum of \$2500 to be

bestowed during the coming year in ten scholarships. This may be regarded as a most valuable supplement to the system of Fellowships.

INTERNAL ADMINISTRATION.

Much attention has been bestowed during the year upon the question of the best method of governing a college. It seems to be conceded that the traditional Faculty meeting of American colleges is not exactly adapted to our circumstances,—and also that there is need of some organization by which the voice of the teaching body may be expressed on matters pertaining to instruction, discipline, examinations, and the selection of new instructors. I do not feel sure as to how this problem will be solved, but there is an obvious tendency to leave different departments of work to committees who are personally interested therein; thus we have a committee on the Library, and another on the making of instruments; and the instructors in kindred departments are in the habit of frequent conference with one another, without being organized under the name of committees. But the chief responsibility has devolved upon the President and Professors. After some discussion last winter the Trustees, whose advice was sought, decided to adhere for the present to the usages which have been followed since the beginning and

to consider the President and Professors, under the name of the Academic Council, responsible for the interior conduct of the University until some further action is taken.

CONCLUSION.

In conclusion allow me to say a few words in respect to the relations of the University to Baltimore. The scholars, as well as the instructors, many of whom have come here from a distance, have been made at home in literary and social organizations, as well as in private households, with the hospitality for which Maryland is noted. The teachers of the city and many of the leading professional men have taken pains to become acquainted with our plans and to show their interest by intelligent comments and suggestions, and by helpful criticisms. Personal favors have been frequently accorded to us by the heads of large establishments, and by public functionaries. The newspapers of the city have been quick to catch the spirit of the University and to call attention to what has been in progress within its walls. For all these indications of good will, I am sure that the present members of the University will always be grateful, remembering that the success of the foundation is largely due to the kind welcome it has received from the people of Baltimore.

On the other hand it has been the desire of the authorities, both in the Board of Trustees and in the Faculty, so to order the University that the citizens might constantly feel the benefits of its establishment,—not only in the facilities afforded for the education of young men, but in many indirect ways:—for example, such lectures as might interest the public have been opened without charge; special classes have been instituted for the purpose of helping on the studies of young professional men, in history and constitutional law, in physiology and the use of the microscope, and in biblical exegesis; like courses, for the benefit of teachers exclusively, have been organized in physiology and morphology, (with instruction in the use of the microscope), in English, mathematics and Latin; requests for addresses and lectures, before schools and seminaries, literary societies, and popular audiences, have been cheerfully complied with; and many industrial, scientific, literary and educational questions have been brought to us, personally and by letter, for discussion and solution. If it is fortunate that the Johns Hopkins University is planted in Baltimore, let us hope that Baltimore may be equally fortunate in the growth of its University.

DANIEL C. GILMAN,

President of the Johns Hopkins University.

APPENDIX.

A.

Academic Staff, 1876-80.*

PRESIDENT.

DANIEL C. GILMAN,	Appointed. December 30, 1874.
-----------------------------	----------------------------------

PROFESSORS.

BASIL L. GILDERSLEEVE, <i>Greek</i> ,	1876.
J. J. SYLVESTER,	<i>Mathematics</i> , 1876.
IRA REMSEN,	<i>Chemistry</i> , 1876.
HENRY A. ROWLAND,	<i>Physics</i> , 1876.
H. NEWELL MARTIN,	<i>Biology</i> , 1876.
CHARLES D. MORRIS,	<i>Classics</i> , 1876.

ASSOCIATES.

JOHN M. CROSS,	<i>Greek</i> , 1876.
PHILIP R. UHLER,	<i>Natural History</i> , 1876.
AUSTIN SCOTT,	<i>History</i> , 1876.
A. MARSHALL ELLIOTT,	<i>Romance Philology</i> , 1876.
THOMAS C. MURRAY,	<i>Shemitic</i> , 1876-1879.
HERMAN C. G. BRANDT,	<i>German</i> , 1876.
WILLIAM K. BROOKS,	<i>Biology</i> , 1876.
HARMON N. MORSE,	<i>Chemistry</i> , 1876.
ROBERT RIDGWAY,	<i>Natural History</i> , 1876-1877.
WILLIAM E. STORY,	<i>Mathematics</i> , 1876.
ARTHUR W. TYLER,	<i>Librarian</i> , 1876-1878.
CHARLES S. HASTINGS,	<i>Physics</i> , 1876.
CHARLES R. LANMAN,	<i>Sanskrit</i> , 1877-1880.
HERBERT B. ADAMS,	<i>History</i> , 1878.
ALBERT S. COOK,	<i>English</i> , 1879.
MINTON WARREN,	<i>Latin</i> , 1879.
WILLIAM HAND BROWNE, <i>Librarian</i> ,	1879.
HENRY SEWALL,	<i>Biology</i> , 1880.

*The names in each group are arranged in the order of appointment.

LECTURERS.

		Years of Service.
SIMON NEWCOMB, .	<i>Astronomy,</i> . . .	1876.
LÉONCE RABILLON, .	<i>French,</i> . . .	1876—
JOHN S. BILLINGS, .	<i>Medical History, etc.,</i> .	1877.
FRANCIS J. CHILD, .	<i>Early English, etc.,</i> .	1877—1878.
THOMAS M. COOLEY, .	<i>Law,</i> . . .	1877—1879.
JULIUS E. HILGARD, .	<i>Geodetic Surveys,</i> .	1877.
JAMES RUSSELL LOWELL, .	<i>Romance Literature,</i> .	1877.
JOHN W. MALLET, .	<i>Technological Chemistry,</i> .	1877—1878.
FRANCIS A. WALKER, .	<i>Political Economy,</i> .	1877—1878.
WILLIAM D. WHITNEY, .	<i>Comparative Philology,</i> .	1877.
WILLIAM F. ALLEN, .	<i>History,</i> . . .	1878.
WILLIAM JAMES, .	<i>Psychology,</i> . . .	1878.
GEORGE S. MORRIS, .	<i>Philosophy,</i> . . .	1878—
J. LEWIS DIMAN, .	<i>History,</i> . . .	1879.
H. VON HOLST, .	<i>History,</i> . . .	1879.
WILLIAM G. FARLOW, .	<i>Botany,</i> . . .	1879.
J. WILLARD GIBBS, .	<i>Theoretical Mechanics,</i> .	1879.
SIDNEY LANIER, .	<i>English Literature,</i> .	1879—1880.
CHARLES S. PEIRCE, .	<i>Logic,</i> . . .	1879—
JOHN TROWBRIDGE, .	<i>Physics,</i> . . .	1880.
J. LEWIS DIMAN, .	<i>History,</i> . . .	1881.
A. GRAHAM BELL, .	<i>Phonology,</i> . . .	1881.

ASSISTANTS.

		Appointed.
HENRY SEWALL, .	<i>Biology,</i> . . .	1876—1878.
SAMUEL F. CLARKE, .	<i>Biology,</i> . . .	1879.
FABIAN FRANKLIN, .	<i>Mathematics,</i> . . .	1879.
LYMAN B. HALL, .	<i>Chemistry,</i> . . .	1879—1880.
CHRISTIAN SIHLER, .	<i>Biology,</i> . . .	1879—1880.
HENRY C. ADAMS, .	<i>Political Economy,</i> .	1879.
THOMAS CRAIG, .	<i>Mathematics,</i> . . .	1879.
WILLIAM T. SEDGWICK, .	<i>Biology,</i> . . .	1880.
EDWIN H. HALL, .	<i>Physics,</i> . . .	1880.
GEORGE H. STOCKBRIDGE, .	<i>Latin and German,</i> .	1880.
PHILIPPE B. MARCOU, .	<i>French,</i> . . .	1880.

B.

Roll of Fellows.*

Where no location is stated, the Johns Hopkins University is to be understood.

1. HENRY CARTER ADAMS, Ph. D., Lecturing upon Political Economy at the Johns Hopkins University, 1879-81.

From Waterloo, Iowa; Denmark Academy, Iowa, 1870; A. B., Iowa College, 1874, and A. M., 1877; Ph. D., Johns Hopkins, 1878; Lecturer upon Political Economy, at Cornell University, 1879-80, at University of Michigan, 1880-81; (*Political Science*, 1876-79.)

History of Taxation in the United States, (Graduating Thesis, J. H. U., 1878), published under the title, Zur Geschichte der Besteuerung in den Vereinigten Staaten von Amerika in der Periode von 1789-1816. (Zeitsch. f. d. gesamt. Staatswissenschaft, Tübingen, 1879.)

Coöperation. (Am. Soc. Sc. Assoc., 1878.)

Historical Position of Socialism in the Development of Political Economy. (Penn Monthly, 1879.)

2. HERBERT BAXTER ADAMS, Ph. D., Associate in History at the Johns Hopkins University, and Lecturer on History at Smith College, Northampton, Mass.

From Amherst, Mass.; Phillips Academy, Exeter, N. H., 1868; A. B., Amherst, 1872; Instructor at Williston Seminary, Easthampton, Mass., 1872-73; Student of History and Political Science at Heidelberg and Berlin, 1873-76; Ph. D., Heidelberg, 1876; Lecturer on History at Smith College, Northampton, Mass., 1878-80; (*History*, 1876-78.)

Maryland's Influence in Founding a National Commonwealth, or the History of the Accession of Public Lands by the Old Confederation. (Maryland Historical Society, 1877.)

3. WILLIAM KEITH BROOKS, Ph. D., Associate in Biology.

From Cleveland, Ohio; A. B., Williams, 1870; Ph. D., Harvard, 1874; Assistant, Boston Society of Natural History, 1874-75; (*Biology*, 1876; *appointed Associate before entering on the Fellowship*.)

On an Organ of Sense in the Lamellibranchiate Genus Yoldia. (Proc. Amer. Assoc., 1874.)

Embryology of the Fresh-Water Mussel. (Proc. Amer. Assoc., 1875.)

Embryology of Salpa. (Proc. Boston Soc. Nat. Hist., 1875.)

The Affinity of the Mollusca and the Molluscoida. (Proc. Boston Soc. Nat. Hist., 1875.)

The Development of Salpa. (Bull., Mus. Comp. Zool., Cambridge, No. 14.)

A Remarkable Life-History. (Am. Nat., Nov., 1876.)

A Provisional Hypothesis of Pangenesis. (Am. Nat., March, 1877.)

Parthenogenesis in Vertebrates and Molluscs. (Am. Nat., Oct., 1877.)

Preliminary Observations upon the Development of the Marine Prosobranchiate Gastropods. (Studies from the Biol. Lab., J. H. U., 1879.)

The Development of Lingula and the Systematic Position of the Branchiopods. (Scientific Results, Chesapeake Zool. Lab., 1879.)

The Larval Stages of Squilla empusa. (Scientific Results, Chesapeake Zool. Lab., 1879.)

Embryology of the Fresh-Water Pulmonates. (Studies from the Biol. Lab., J. H. U., 1879.)

Abstract of Observations on the Development of the American Oyster. (Zool. Anzeiger, 1880.)

The Artificial Fertilization of Oyster Eggs and the Propagation of the American Oyster. (Am. Jour. of Science, 1880.)

The Development of the American Oyster. (Report of the Maryland Fish Commission, and Studies from the Biol. Lab., J. H. U., 1880.)

The Acquisition and Loss of a Food Yolk in Molluscan Eggs. (Studies from the Biol. Lab., J. H. U., 1880.)

The Development of the Cephalopoda and the Homology of the Cephalopod Foot. (Am. Jour. of Science, 1880.)

The Rhythmical Character of Segmentation. (Am. Jour. of Science, 1880.)

Budding in Free Medusae. (Am. Nat., 1880.)

Embryology and Metamorphosis of Lucifer. (Zool. Anzeiger, 1880.)

The Early Stages of the Squid. (Mem. Boston Soc. Nat. Hist., 1880.)

*See statement of System of Fellowships on page 51.

4. THOMAS CRAIG, Ph. D., Tidal Division, U. S. Coast and Geodetic Survey, Washington, D. C.; Lecturing on Mathematics at the Johns Hopkins University, 1879-81.

From Pittston, Pa.; C. E., Lafayette, 1875; Ph. D., Johns Hopkins, 1878; (*Mathematics*, 1876-78; *Physics*, 1878-79.)

Representation of one Surface upon another, and on some points in the Theory of the Curvature of Surfaces. (Graduating Thesis, J. H. U., 1878.)
 Motion of a Point upon the Surface of an Ellipsoid. (Am. Jour. of Math., 1878.)
 Mathematical Theory of Fluid Motion. (Van Nostrand's Eng. Mag., 1879.)
 Wave and Vortex Motion. (N. Y., Van Nostrand, 1879.)
 Motion of a Solid in a Fluid. (N. Y., Van Nostrand, 1879.)
 Motion of a Solid in a Fluid. (Am. Jour. of Math., 1879.)
 General Differential Equation for Developable Surfaces. (Jour. of Franklin Inst., 1879.)
 Treatise on the Mathematical Theory of Projections. (U. S. Coast Survey, 1879.)
 Projection of the General Locus of Space of Four Dimensions into Space of Three Dimensions. (Am. Jour. of Math., 1879.)
 Motion of an Ellipsoid in a Fluid. (Am. Jour. of Math., 1879.)
 Motion of Viscous Fluids. (Jour. of Franklin Inst., 1880.)
 Steady Motion in Viscous Fluids. (Philos. Mag., 1880.)
 Orthomorphic Projection of the Ellipsoid upon a Sphere. (Am. Jour. of Math., 1880.)

5. JOSHUA WALKER GORE, Professor of Natural Science, South-western Baptist University, Jackson, Tenn.

From Frederick County, Va.; C. E., University of Virginia, 1875; (*Mathematics*, 1876-78.)

6. GEORGE BRUCE HALSTED, Ph. D., Tutor in Mathematics at Princeton College.

From New York City; A. B., Princeton, 1875, and A. M., 1878; Fellow of Princeton College, and Student at School of Mines, Columbia College, 1875-76; Student at Berlin, 1877; Ph. D., Johns Hopkins, 1879; (*Mathematics*, 1876-78.)
 Basis for a Dual Logic. (Graduating Thesis, J. H. U., 1879.)
 Spencer's Classification of the Abstract Sciences. (Popul. Sc. Mon., 1877.)
 The New Ideas about Space. (Popul. Sc. Mon., 1877.)
 Bibliography of Hyper-Space and Non-Euclidean Geometry. (Am. Jour. of Math., 1878-79.)
 Note on the First English Euclid. (Am. Jour. of Math., 1879.)
 Historical Sketch of Exact Rectilinear Motion. (Van Nostrand's Eng. Mag., 1878.)
 Mechanical Conversation of Motion. (Van Nostrand's Eng. Mag., 1878; reprinted in "World of Science," London.)
 Jevons's Criticism of Boole's Logic. (Mind, 1878.)
 Boole's Logical Method. (Jour. of Spec. Philos., 1878.)
 Statement and Reduction of Syllogism. (Jour. of Spec. Philos., 1878.)
 Algorithmic Division in Logic. (Jour. of Spec. Philos., 1879.)
 Modern Mathematicians as Educators. (Nassau Lit. Mag., XXXII, 2.)
 Is Formal Logic a Branch of Mathematics. (Nassau Lit. Mag., XXXII, 3.)
 Algebras, Spaces, Logics. (Popul. Sc. Mon., 1880.)
 Metrical Geometry: A Treatise on Mensuration. (1880.)

7. EDWARD HART, Ph. D., Assistant Professor of Chemistry at Lafayette College.

From Doylestown, Pa.; S. B., Lafayette, 1874; Ph. D., Johns Hopkins, 1879; (*Chemistry*, 1876-78.)

Nitrosulphobenzoic Acids and their Derivatives. (Graduating Thesis, J. H. U., 1879; Am. Chem. Jour., 1879.)
 Volumetric Estimation of Sulphuric Acid. (Am. Chemist, VI, 284.)
 Volumetric Estimation of Iron. (Chem. News, XXXIV, 66.)
 Ueber Isomere Sulfosäuren aus Paranitrotoluene. (Ber. d. deut. chem. Ges., X, 1046)
 Notes from Chem. Lab., J. H. U., 1877.)
 Handbook of Volumetric Analysis. (N. Y., Wiley, 1878.)
 Stopcock of Easy Construction. (Am. Chemist, 1879.)

8. DANIEL WEBSTER HERING, Professor of Mathematics at Western Maryland College, Westminster.

From Mechanicstown, Md.; Ph. B., Yale, 1872; Assistant Engineer, Berks County Railroad, Pa., 1873-74; C. E., Yale, 1878; Assistant Engineer, Baltimore and Cumberland Valley Railroad, 1878-80; (*Engineering*, 1876-78.)

9. MALVERN WELLS ILES, Ph. D., Chemist, Leadville, Colorado.

From Davenport, Iowa; Ph. B., Columbia, 1875, and Ph. D., 1877; (*Chemistry*, 1876-78.)

A New Qualitative Reaction for Boracic Acid. (*Am. Chemist*, 1876.)
On the Action of Ozone upon Milk. (*Sc. Amer.*, 1877.)
On the Oxidation of Sulpho-Acids derived from Metaxylene. (Notes from Chem. Lab., J. H. U., 1877.)
On the Oxidation of Xylenesulphonic Acids. (With Prof. Rensen; Notes from Chem. Lab., J. H. U., 1877-78. *Am. Chem. Jour.*, 1879.)
A New Method for the Quantitative Estimation of Sulphur. (Notes from Chem. Lab., J. H. U., 1878.)

10. WILLIAM WHITE JACQUES, Ph. D., Electrician of the American Bell Telephone Co., Boston, Mass.

From Newburyport, Mass.; S. B., Mass. Institute of Technology, 1876; Ph. D., Johns Hopkins, 1879; (*Physics*, 1876-79.)

Light Transmitted by One or More Plates of Glass. (*Proc., Am. Acad.*, 1875.)
Answer to M. Jamin's Objections to Ampère's Theory. (*Proc., Am. Acad.*, 1875.)
Diffraction of Sound. (*Proc., Am. Acad.*, 1876.)
An Experimental Proof of the Law of Inverse Squares for Sound. (*Proc., Am. Acad.*, 1876.)
Effect of the Motion of Air within an Auditorium upon its Acoustic Qualities. (*Jour. of Franklin Inst.*, 1878.)
Velocity of Very Loud Sounds. (*Am. Jour. of Science*, 1879.)
Diamagnetic Constants of Bismuth and Calc Spar Crystals in Absolute Measure. (*Am. Jour. of Science*, 1879.)
Distribution of Heat in the Spectra of Various Sources of Radiation. (Graduating Thesis, J. H. U., 1879; *Proc., Am. Acad.*, 1879.)

11. CHARLES ROCKWELL LANMAN, Ph. D., Professor of Sanskrit at Harvard University.

From Norwich, Conn.; A. B., Yale, 1871, and Ph. D., 1873; Student at Berlin, 1873-74, Tübingen, 1874-75, Leipzig, 1875-76; Secretary and Curator of the American Philological Association, 1879-81; Associate in Sanskrit, 1877-80; (*Sanskrit*, 1876-77.)

Contributions to Grassmann's Wörterbuch zum Rig-Veda. (Leipzig, 1873-75.)
Compendium of Sanskrit Paradigms. (1876.)
A Conjectural Emendation of Rig-Veda I. 30. 11. (*Am. Or. Soc. Proc.*, 1877.)
On Tentative Linguistic Forms. (*Am. Or. Soc. Proc.*, 1878.)
Noun-Inflection in the Veda. (*Am. Or. Soc. Jour.*, Vol. X., pp. 325-615.)
On Catalectic Vedic Verses of Seven Syllables. (*Am. Or. Soc. Proc.*, 1880.)
A Sanskrit Reader, with Dictionary and Notes. Part I. Text, (in press.)

12. DAVID MCGREGOR MEANS, New York City.

From Andover, Mass.; A. B., Yale, 1868; Professor of Political and Mental Science in Middlebury College, Vermont, 1877-80; (*Political Science*, 1876-77.)

Aristotle. (*Bibliotheca Sacra*, 1876-77.)
The Pardoning Power. (*New Englander*, 1875.)
The Trouble with the Caucasus. (*New Englander*, 1875.)
Are all Criminals insane? (*New Englander*, 1876.)
Chinese Immigration and Political Economy. (*New Englander*, 1877.)
Nominalism. (*Mind*, 1879.)
Taxation of Mortgages. (*New Englander*, 1880.)
Data of Ethics. (*Bibliotheca Sacra*, 1880.)

13. HARMON NORTHPROP MORSE, Ph. D., Associate in Chemistry.

From Cambridge, Vt.; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Instructor in Chemistry in Amherst College, 1875-76; (*Chemistry*, 1876; *appointed an Associate before entering upon the Fellowship.*)

Benzoylamidophenols. (Ber. d. deut. chem. Ges., 1874.)
Ueber Einige Derivate des Ortho- und Paramidophenols. (Inaugural Dissertation, Göttingen, 1875.)

On the Oxidation of Bromethyltoluene and of Similar Substitution Products. (Notes from Chem. Lab., J. H. U., 1877.)

On Acetylamidophenols by Reduction of Ortho- and Paranitrophenols by means of Glacial Acetic Acid and Tin. (Notes from Chem. Lab., J. H. U., 1877.)

On the Determination of Barium as Chromate. (Am. Chem. Jour., 1880.)

14. WALTER HINES PAGE, Cary, N. C.

From Cary, N. C.; Randolph-Macon, Va., 1876; Assistant Professor of Greek and English in Randolph-Macon College, 1875-76; Lecturer to the N. C. Normal College, 1878; Professor in Louisville (Ky.) Male High School, 1878-79; (*Greek*, 1876-78.)

15. P. PORTER POINIER.

From Newark, N. J.; M. E., Stevens Inst. of Technology, 1874; (*Physics*, 1876; *died, without entering upon the Fellowship, June, 11, 1876, aged 23 years.*)

Formulee for the Apparent Specific Heat of Saturated Vapors. (Jour. of Franklin Inst., 1875.)

16. ERASMUS DARWIN PRESTON, U. S. Coast and Geodetic Survey, now stationed in Baltimore.

From Spruce Grove, Pa.; B. C. E., Cornell, 1875; Assistant Engineer Cornell University Hydraulic Works, 1875; Instructor in Cornell University, 1875-76; (*Engineering*, 1876-78.)

17. HENRY JOSEPH RICE, Professor of Natural Sciences at Michigan Military Academy, Orchard Lake, Michigan.

From Cazenovia, N. Y.; B. S., Cornell, 1876, and M. S., 1880; Student of Biology, University of France, Paris, 1878; Assistant U. S. Fish Commission, 1879; (*Biology*, 1876-78.)

Observations upon the Hatching, Variation, and Development of the Raritan River Smelt, *Osmerus eperlanus*, (Md. Fish Commission, 1878.)

Notes upon the Development of the Shad, *Alosa sapidissima*. (Md. Fish Commission, 1878.)

Observations upon the Habits, Structure and Development of *Amphioxus lanceolatus*. (Am. Nat., 1880; trans. in Journal de Micrographie, Paris, 1880.)

18. JOSIAH ROYCE, Ph. D., Assistant Professor of Literature at the University of California.

From Oakland, Cal.; A. B., University of California, 1875; Ph. D., Johns Hopkins, 1878; (*Philosophy*, 1876-78.)

Interdependence of the Principles of Human Knowledge. (Graduating Thesis, J. H. U., 1878.)

Schiller's Ethical Studies. (Jour. of Spec. Philos., 1878.)

Shelley and the Revolution. (Californian, 1880.)

Nature of Voluntary Progress. (Berkeley Quarterly, 1880.)

19. ERNEST GOTTLIEB SIHLER, Ph. D., Classical Instructor, New York City.

From Fort Wayne, Ind.; Concordia College [German Gymnasium, Fort Wayne], 1869; Student of Classical Philology at Berlin and Leipsic, 1872-75; Ph. D., Johns Hopkins, 1878; (*Greek*, 1876-79.)

Plato's Use of Metaphor and Comparison. (Graduating Thesis, J. H. U., 1878.)
Herodotus, Æschylus and the Battle of Salamis. (Trans., Am. Philol. Assoc., 1877.)
The Rhetorical and Critical Labors of Dionysius of Halicarnassus. (Proc., Am. Philol. Assoc., 1879.)
Character and Career of Tiberius. (Penn Monthly, 1880.)
Virgil and Plato. (Trans., Am. Philol. Assoc., 1880.)

20. FREDERICK BOYD VAN VORST, Attorney at Law, New York City.

From New York City; A. B., Princeton, 1875; Fellow in Metaphysics in Princeton College, 1875-76; (*Ethics and Metaphysics*, 1876-77.)

21. JOHN HENRY WHEELER, Ph. D., Tutor at Harvard University.

From Woburn, Mass.; A. B., Harvard, 1871, and A. M., 1875; Fellow of Harvard University, 1877-80; Ph. D., Bonn, 1879; (*Philology*, 1876-77.)

De Alcestitidis et Hippolyti Euripidearum Interpolationibus. (Inaugural Dissertation, Bonn, 1879.)

22. SAMUEL FESSENDEN CLARKE, Ph. D., Assistant in Biological Laboratory, 1879-80.

From Geneva, Ill.; Assistant Zoölogist U. S. Fish Commission, 1874-75; Assistant in Zoölogy in Sheffield Scientific School, 1874-76; Ph. B., Yale, 1878; Ph. D., Johns Hopkins, 1879; (*Biology*, 1876-79.)

New and Rare Species of Hydroids from the New England Coast. (Conn. Acad., 1875.)
New Hydroids of the Pacific Coast, South of Vancouver Island. (Conn. Acad., 1876.)
Hydroids of Alaska. (Acad. Nat. Sc., Phila., 1876; Smithsonian Institution, 1876.)
Hydroids of the Gulf Stream and Gulf of Mexico. (Mus. Comp. Zool., Camb., Mass., 1879.)
Development of Amblystoma punctatum, Baird. (Biol. Lab., J. H. U., 1879.)
Development of a Double-headed Vertebrate. (Boston Soc. Nat. Hist., 1880.)

23. LYMAN BEECHER HALL, Ph. D., Professor of Chemistry and Physics at Haverford College, Montgomery County, Pa.

From New Bedford, Mass.; Phillips Academy, Andover, Mass., 1869; A. B., Amherst, 1873; Ph. D., Göttingen, 1875; Assistant in Chemical Laboratory, 1879-80; (*Chemistry*, 1877-79.)

Ueber Orthonitrosalicylsäure und einige Abkömmlinge derselben. (Inaugural Dissertation, Göttingen, 1875.)
On the Oxidation of Mesitylene-Sulphonic Acid. (Notes from Chem. Lab., J. H. U., 1877; Ber. d. deut. chem. Ges., X.)
On the Oxidation of Substitution Products of Mesitylene. (Notes from Chem. Lab., J. H. U., 1878.)
Ueber Oxidationsprodukte aus Cymosulfamid. (Ber. d. deut. chem. Ges., XII.)
On the Oxidation of Substitution Products of Aromatic Hydrocarbons. (With Professor Remsen; Am. Chem. Jour., 1880.)

24. ALEXANDER DUNCAN SAVAGE, Assistant Director of the Metropolitan Museum of Art in New York.

From Pass Christian, Miss.; B. Litt., University of Virginia, 1870; (*Greek*, 1876-79.)

The "Oath of Rhadamanthus." (Proc., Am. Philol. Assoc., 1878.)

25. FABIAN FRANKLIN, Ph. D., Assistant in Mathematics.

From Baltimore; Ph. B., Columbian University, 1869; Engineer Corps, Pittsburg and Connellsville Railroad, 1870-71; City Surveyor's Office, Baltimore, 1871-77; Graduate Student of Mathematics, 1876-77; Ph. D., Johns Hopkins, 1880; (*Mathematics*, 1877-79.)

Bipunctual Coördinates. (Graduating Thesis, J. H. U., 1880; *Am. Jour. of Math.*, 1878.)
Notes on Partitions of Numbers, etc. (*Am. Jour. of Math.*, 1878; 1879.)
On the Calculation of the Generating Functions and Groundforms for Binary Quantics. (*Am. Jour. of Math.*, 1880.)

26. CHRISTIAN SIHLER, Physician, Cleveland, Ohio.

From Fort Wayne, Ind.; Concordia, 1866; M. D., University of Michigan, 1871; Assistant in Biological Laboratory, 1879-80; (*Biology*, 1877-79.)

On the so-called Heat-Dyspnoea. (*Jour. of Physiol.*, 1879.)
Some Further Observations on Heat-Dyspnoea. (*Jour. of Physiol.*, 1880.)

27. FRANCIS GREENLEAF ALLINSON, Ph. D., Assistant Professor of Greek and Latin at Haverford College.

From Burlington, N. J.; A. B., Haverford, 1876, and A. M., 1879; A. B., Harvard, 1877; Temporary Instructor in Greek at Haverford College, 1878; Ph. D., Johns Hopkins, 1880; (*Greek and Sanskrit*, 1877-80.)

On Ionic Forms in the Second Century, A. D., and the obligations of Lucian to Herodotus. (Graduating Thesis, J. H. U., 1880.)
Attributive Positions of the Possessive Pronoun in Herodotus, Lysias, Isocrates and Demosthenes. (Quaker Alumnus, Phila., 1878.)
A Proposed Redistribution of Parts in the Parodos of the Vespae of Aristophanes. (*Am. Jour. of Philol.*, 1880.)

28. MAURICE BLOOMFIELD, Ph. D., Student of Philology at Leipzig, Germany.

From Chicago, Ill.; A. M., Furman University, (S. C.), 1877; Ph. D., Johns Hopkins, 1879; Student of Philology at Vienna, 1879-80; (*Sanskrit and Greek*, 1878-79.)

Noun-Formation of Rig Veda. (Graduating Thesis, J. H. U., 1879.)
The Ablaut of Greek Roots which show Variation between E and O. (*Am. Jour. of Philol.*, 1880.)

29. CONSTANTINE FAHLBERG, Ph. D., Chemist, Gray's Ferry Chemical Works, Philadelphia.

From Tambow, Russia; Ph. D., Leipsic, 1873; Director of the United Brunswick-Hanover Metallurgical Laboratory, Oker, Harz-Mountains, 1874-75; Analytical and Consulting Chemist, New York City, 1875-76; Assistant in Dr. Halse's Technological Laboratory, London, 1876-77; Chemist of the Colonial Company, London and Demerara (South America), 1877-78; Graduate Student of Chemistry, 1878; (*Chemistry*, 1878-80.)

Determination of Calcium Monosulphide in Boneblack. (*Zeitsch. f. analyt. chem.*, 1871.)
On Oxycetic Acid. (Dissertation, Leipsic, 1873; *Kolbe's Jour.*, 1873.)
New Method for the Volumetric Estimation of Zinc. (*Zeitsch. f. analyt. chem.*, 1875.)
Description of the Manufacture of Cane Sugar in Demerara. (*Royal Gazette*, 1877.)
Method for the Manufacture of Zinc Carbonate from Zinc Sulphate. (U. S. Patent Office, 1878.)
A New Method for the Quantitative Estimation of Sulphur. (Notes from Chem. Lab., J. H. U., 1878.)
On the Oxidation of Tolueneorthosulphamide. (With Prof. Remsen; *Ber. d. deut. chem. Ges.*, 1878; *Am. Chem. Jour.*, 1880.)
On the Liquid Toluenesulphochloride. (*Am. Chem. Jour.*, 1879.)
Reply to Delachanal and Mermet. (*Ber. d. deut. chem. Ges.*, 1879.)
On Toluenedisulphonic Acid and its Derivatives. (*Am. Chem. Jour.*, 1880.)

30. EDWIN HERBERT HALL, Ph. D., Assistant in Physics.

From Gorham, Maine; A. B., Bowdoin, 1875; Graduate Student of Physics, 1877-78; (*Physics*, 1878-80.)

On a New Action of the Magnet on Electric Currents. (*Am. Jour. of Math.*, 1879.)
On Boltzmann's Method of Determining the Velocity of an Electric Current. (*Am. Jour. of Science*, 1880.)
On the New Action of Magnetism on a Permanent Electric Current. (Graduating Thesis, J. H. U., 1880; *Am. Jour. of Science*, 1880.)

31. EDWARD COLES HARDING, Classical Instructor, New York City.

From Northumberland County, Va.; A. M., University of Virginia, 1876; Law Department, University of Virginia, 1876-77; Classical Instructor, Baltimore, 1877-78; Professor of Greek, University of Louisiana, 1879-80; (*Greek*, 1878-79.)

32. ISAAC OTT, Physician, Easton, Pa.

From Easton, Pa.; M. D., University of Pennsylvania, 1869; Resident Physician in St. Mary's Hospital, Philadelphia, 1870; Lecturer on Experimental Physiology in the University of Pennsylvania, 1876-77; A. M., Lafayette, 1877; (*Biology*, 1878-79.)

Cocain, Veratria and Gelsemium. (*Phila.*, 1874.)
Rapidité of Transmission of Nerve Force in Normal and Stretched Nerves. Extra Polar Kataliectrotonus. (*Jour. of Nervous and Mental Diseases.*)
The Action of Medicine. (*Phila.*, Lindsey, 1868.)
Sweat-Centres. The Action of Muscarin and Atropin on them. (*Jour. of Physiol.*, 1878.)
Observations on the Spinal Cord. (Studies from the Biol. Lab., J. H. U., 1880; *Jour. of Physiol.*, 1879.)
Contribution to Physiology and Pathology of Nervous System, I & II. (*Phila.*, 1879-80.)
Also a large number of minor contributions to *Phila. Med. Times*; *Boston Med. Journal*; *Jour. of Nerv. and Ment. Diseases*, etc.

33. HENRY SEWALL, Ph. D., Associate in Biology.

From Baltimore; S. B., Wesleyan, 1876; Graduate Student of Biology, and Assistant in Laboratory, 1876-78; Ph. D., Johns Hopkins, 1879; Student of Biology, at Leipzig, 1879-80; (*Biology*, 1878-79.)

Development and Regeneration of Gastric Glandular Epithelium during Fœtal Life and after Birth. (*Jour. of Physiol.*, 1878.)
On the Effect of Two Succeeding Stimuli upon Muscular Contraction. (*Jour. of Physiol.*, 1879.)
On the Changes in Pepsin-forming Glands during Secretion. (With J. N. Langley; *Jour. of Physiol.*, 1879.)
Zur Physiologie des Sehepithels, insbesondere der Flische. (With W. Kühne; *Untersuch.*, a. d. *Physiol. Inst. z. Heidelberg*, 1880.)

34. WASHINGTON IRVING STRINGHAM, Ph. D., Parker Fellow of Harvard University, and Student of Philosophy in the University of Leipzig.

From Topeka, Kansas; A. B., Harvard, 1877; Graduate Student of Mathematics, 1877-78; Ph. D., Johns Hopkins, 1880; (*Mathematics*, 1878-80.)

Investigations in Quaternions. (*Proc.*, *Am. Acad.*, 1878.)
Some General Formulæ for Integrals of Irrational Functions. (*Am. Jour. of Math.*, 1879.)
The Quaternion Formulæ for Quantification and for Barycentres. (*Am. Jour. of Math.*, 1879.)
Regular Figures in n-Dimensional Space. (Graduating Thesis, J. H. U., 1880; *Am. Jour. of Math.*, 1880.)

35. ABRAM VAN EPPS YOUNG, Resident Graduate.

From Grand Rapids, Mich.; Ph. B., University of Michigan, 1875; Assistant in Chemistry and Physics in the University of Michigan, 1875-77; Graduate Student of Chemistry, 1877-78; (*Chemistry*, 1878-80.)

An Apparatus for Gas Analysis from Simple Laboratory Material. (*Am. Chem. Jour.*, 1879.)

36. CHARLES ROBERT HEMPHILL, Professor of Ancient Languages at the Southwestern Presbyterian University, Clarksville, Tenn.

From Chester, S. C.; University of South Carolina, 1869; University of Virginia, 1871; Southern Presbyterian Theological Seminary, 1874, and Tutor in Hebrew in same, 1874-78; A. M., Davidson, 1878; (*Greek*, 1878-79.)

37. ALLAN MARQUAND, Fellow by Courtesy.

From New York City; St. Paul's School, Concord, N. H., 1871; A. B., Princeton, 1874; Tutor in Princeton College, 1876; Union Theological Seminary, New York, 1877; Student at Berlin, 1877-78; Ph. D., Johns Hopkins, 1880; (*Logic and Ethics*, 1878-80.)

The Logic of the Epicureans,—with a translation of a treatise of Philodemus—*περί σημείων και σημειώσεων*. (Graduating Thesis, J. H. U., 1880.)

38. CHARLES AMBROSE VAN VELZER.

From Ithaca, N. Y.; S. B., Cornell, 1876; Instructor in Mathematics at Cornell University, 1876-77; (*Mathematics*, 1878-81.)

39. BROWN AYRES, Professor of Physics at the University of Louisiana, New Orleans.

From New Orleans, La.; S. B., Stevens Inst. of Technology, 1878; Graduate Student of Mathematics and Physics, 1878-79; (*Physics*, 1879-80.)

The Gramme Machine. (*Sc. Amer. Supp.*, 1876.)

The Telephone. (*Jour. of Franklin Inst.*, 1878.)

New Arrangement for Telephone. (*Sc. Amer. Supp.*, 1878.)

Two New Forms of Bell Telephone. (*Jour. of Franklin Inst.*, 1878.)

40. LOUIS BEVIER.

From Marblatown, N. Y.; A. B., Rutgers, 1878; Graduate Student of Greek, 1878-79; (*Greek*, 1879-81.)

41. EDWARD MUSSEY HARTWELL.

From Littleton, Mass.; Public Latin School, Boston, Mass., 1869; A. B., Amherst, 1873, and A. M., 1876; Vice-Principal of High School, Orange, N. J., 1873-74; Instructor in Public Latin School, Boston, 1874-77; Student in Miami Medical College, Cincinnati, Ohio, 1877-78; Graduate Student of Biology and Chemistry, 1878-79; (*Biology*, 1879-81.)

The Function of the Internal Intercostal Muscles. (With Prof. H. N. Martin; *Jour. of Physiol.*, 1879.)

The Legal Status of Anatomical Science. (*Jour. of Social Science*, 1880, in press.)

American Anatomy Acts; six articles. (*Boston Med. and Surg. Jour.*, 1880.)

The Earliest English and American Medical Acts. (*Boston Med. and Surg. Jour.*, 1880.)

42. JOHN ROBIN McDANIEL IRBY, Ph. D.

From Lynchburg, Va.; Miller Scholar of University of Virginia, 1873-75; S. B., University of Virginia, 1875; Ph. D., Göttingen, 1878; (*Mineralogy*, 1879-80.) *Died, March, 25, 1880.*

Eine kritische Untersuchung ueber die bei dem Kalkspath vorkommenden Skalenoeeder. (Prize Essay of the University of Bonn, 1877, expanded and published under the title, On the Crystallography of Calcite, Bonn, 1878; Groth's Zeitschrift, Bd. III.)

43. MITSURU KUHARA.

From Tsuyama, Japan; Assistant in Chemical Laboratory in University of Tokio, 1878-79; S. B., University of Tokio, 1879; (*Chemistry*, 1879-81.)

On the Red Colouring Matter of the Lithospermum erythrorhizon. (Jour. of Chem. Soc., London, 1879.)

A Method of Estimating Bismuth Volumetrically. (Am. Chem. Jour., 1879.)

44. OSCAR HOWARD MITCHELL.

From Marietta, Ohio; A. B., Marietta, 1875, and A. M., 1878; Principal of High School at Marietta, 1875-78; Graduate Student of Mathematics, 1878-79; *Mathematics*, 1879-81.)

On Binomial Congruences: Comprising an Extension of Fermat's and Wilson's Theorema, and a Theorem of which Both are Special Cases. (Am. Jour. Math., in press.)

45. EDWARD LEAMINGTON NICHOLS, Ph. D., Physicist, Edison's Laboratory, Menlo Park, N. J.

From Peekskill, N. Y.; S. B., Cornell, 1875; Student of Physics at Leipsic, Berlin, and Göttingen, 1875-79; Ph. D., Göttingen, 1879; (*Physics*, 1879-80.)

Ueber die Volumenvermehrung der Flüssigkeiten durch Absorption von Gasen. (Pogg. Annalen, 1878, N. F., Bd. 3.)

Ueber das von glühendem Platin ausgestrahlte Licht. (Inaugural Dissertation, Göttingen, 1879.)

On the Color of the Sky. (Philos. Mag., 1879.)

On the Character and Intensity of the Rays emitted by glowing Platinum. (Am. Jour. of Science, 1879.)

On the Measurement of High Temperatures. (Am. Jour. of Science, 1880.)

On the Co-efficient of Expansion of Gas Solutions. (With A. W. Wheeler; Am. Assoc., Boston, 1880; abstract in Science, 1880.)

46. WALDO SELDEN PRATT, Second Assistant Director of the Metropolitan Museum of Art, New York City.

From Williamstown, Mass.; Phillips Academy, Andover, Mass., 1874; A. B., Williams, 1878; Graduate Student of Greek and Archæology, 1878-79; (*Aesthetics and the History of Art*, 1879-80.)

Two Essays on the Columnar Architecture of the Egyptians. (Proc. Am. Acad., 1880.)

47. WILLIAM THOMPSON SEDGWICK, Assistant in the Biological Laboratory.

From Farmington, Conn.; Ph. B., Yale, 1877; Student in Yale Medical School, 1877-78; Instructor in Physiological Chemistry and Toxicology in Sheffield Scientific School, 1878-79; (*Biology*, 1879-80.)

The Influence of Quinine upon the Reflex-excitability of the Spinal Cord. (Jour. of Physiol., 1880.)

48. HERMAN VOORHEES.

From Troy, N. Y.; C. E., Rensselaer Polytechnic Inst., 1873; Graduate Student of Chemistry, 1878-79; (*Chemistry*, 1879; *died October 14, 1879, without entering on the Fellowship, aged 27 years.*)

49. CHARLES OTIS WHITMAN, Ph. D., Professor of Zoölogy at the University of Tokio, Japan.

From Newton Highlands, Mass.; A. B., Bowdoin, 1868, and A. M., 1871; Ph. D., Leipsic, 1878; (*Biology*, 1879; *did not enter upon the Fellowship*.)

The Embryology of Clepsine. (*Quart. Micros. Jour.*, London, 1878.)

50. EDMUND BEECHER WILSON.

From Geneva, Ill.; Ph. B., Yale, 1878; Assistant in Zoölogy at Yale College, 1877-79; (*Biology*, 1879-81.)

Description of Two New Genera of Pycnogonida. (*Am. Jour. of Science*, 1878.)

The Pycnogonida of New England and Adjacent Waters. (*U. S. Fish Comm. Report*, 1877.)

A Synopsis of the Pycnogonida of New England. (*Conn. Acad.*, 1878.)

Preliminary Abstract of Observations on the Early Stages of some Polychaetous Annelides. (*Zoölog. Anzeiger*, 1880.)

Notes on the Early Stages of some Polychaetous Annelides. (*Am. Jour. of Science*, 1880.)

The Metamorphosis of Actinotrocha. (*Am. Assoc.*, 1880; abstract in *Am. Nat.*, 1880.)

The Early Stages of *Benilia*. (*Am. Jour. of Science*, 1880.)

51. GEORGE FREDERICK NICOLASSEN.

From Baltimore; A. B., University of Virginia, 1879, and A. M., 1880; (*Greek*, 1879-81.)

52. WILLIAM BURNET, Ph. D., Professor of Chemistry at the South Carolina Agricultural College, Columbia.

From Davidson College, N. C.; S. B., Davidson, 1875; Student of Chemistry at Leipsic, Heidelberg, and Paris, 1875-79; Ph. D., Heidelberg, 1879; (*Chemistry*, 1879-80.)

On Erbium and Yttrium. (*Jour. of Chem. Soc.*, London, 1879.)

53. ROBERT WOODWORTH PRENTISS.

From New Brunswick, N. J.; S. B., Rutgers, 1878; Graduate Student of Mathematics, 1878-79; (*Mathematics*, 1879-81.)

54. JAMES WILSON BRIGHT.

From Lock Haven, Pa.; A. B., Lafayette, 1877, and A. M., 1880; Graduate Student of Teutonic Languages, 1879-80; (*Teutonic Languages*, 1880-81.)

55. BENJAMIN CHAPMAN BURT.

From Ann Arbor, Michigan; A. B., University of Michigan, 1875, and A. M., 1879; Professor of English Literature in Indiana State Normal School, 1875-78; Graduate Student of Philosophy, 1879-80; (*Philosophy*, 1880-81.)

56. SPENCER HEDDEN FREEMAN.

From Mumford, N. Y.; A. B., Rochester, 1875, and A. M., 1878; Teacher of Physical Science, Le Roy Academy, N. Y., 1875-76; Instructor in Mathematics and Physics, Denison University, 1876-78; Graduate Student of Physics and Mathematics, 1879-80; (*Physics*, 1880-81.)

57. KAKIOHI MITSUKUBI.

From Tokio, Japan; Ph. B., Yale, 1879; Graduate Student of Biology, 1879-80; (*Biology*, 1880-81.)

58. BERNARD FRANCIS O'CONNOR.

From Paris, France; Bach. ès lettres, Université de France, 1874; Graduate Student of Romance Languages, 1879-80; (*Romance Languages*, 1880-81.)
French verbs in *eler* and *eter*. (*Am. Jour. of Philol.*, 1880.)

59. CHASE PALMER.

From Baltimore; Matriculated Student, 1876-79, A. B., 1879, and Graduate Student, 1879-80; (*Chemistry*, 1880-81.)

60. HERBERT MILLS PERRY.

From New Ipswich, N. H.; Appleton Academy, N. H., 1868-71; Phillips Academy, Exeter, N. H., 1876; A. B., Harvard, 1880; (*Mathematics*, 1880-81.)

61. WILLIAM LEE ROWLAND.

From Springfield, Mass.; Springfield High School; Massachusetts Inst. of Technology; S. B., University of Pennsylvania, 1878, and Assistant in Chemistry, 1878-80; (*Chemistry*, 1880; *did not enter upon the Fellowship*.)

62. EDWARD HENRY SPIEKER.

From Baltimore; Matriculated Student, 1877-79, A. B., 1879, and Graduate Student, 1879-80; (*Greek*, 1880-81.)

63. MORRISON ISAAC SWIFT.

From Ashtabula, Ohio; Grand River Institute, Ohio, 1874-75; Western Reserve College, 1875-77; Williams College, 1877-79, and A. B., 1879; Graduate Student of Greek and Philosophy, 1879-80; (*Philosophy*, 1880-81.)

64. ARTHUR WILSON WHEELER.

From Rockland, Mass.; A. B., Amherst, 1879; Graduate Student of Physics, 1880; (*Physics*, 1880-81.)

On the Co-efficient of Expansion of Gas Solutions. (With E. L. Nichols; *Am. Assoc.*, Boston, 1880; abstract in *Science*, 1880.)

65. ROBERT DORSEY COALE.

From Baltimore; C. E., Pennsylvania Military Academy, 1875; Special Student of Chemistry, 1876-80; (*Chemistry*, 1880-81.)

On Anhydrosulphamineisophthalic Acid. (With Prof. Remsen; *Ber. d. deut. chem. Ges.*, 1879.)

66. ANDREAS FRANZ WILHELM SCHIMPER.

From Strassburg, Germany; Gymnasium at Strassburg, 1864-1874; Ph. D., Strassburg, 1878; Assistant and Provisional Director in the Museum of Natural History, Strassburg, 1878-80; (*Biology*, 1880-81.)

Blödit und Glaubert von Vurcha in Pendschab. (*Zeitsch. für Krystallographie*, 1877.)
Untersuchungen über die Proteinkrystalloide der Pflanzen. (Inaugural Dissertation; Strassburg, 1878.)

Kupferkies in *Groth*, "Die Mineraliensammlung der Universität Strassburg." (Strassburg, 1879.)

Die Vegetationsorgane von *Prosopanche Burmeisteri*. (Abhandl. der naturforsch. Ges. zu Halle, 1880.)

Die Krystallisation der eiweissartigen Substanzen. (*Zeitsch. für Krystallographie*, 1880; in press.)

Untersuchungen über die Entstehung der Stärkekörner. (*Botanische Zeitung*, 1880; in press.)

C.

Graduates.

1878.

DOCTORS OF PHILOSOPHY.

- HENRY CARTER ADAMS, (*A. B.*, *Iowa*, 1874).
 THOMAS CRAIG, (*C. E.*, *Lafayette*, 1875).
 JOSIAH ROYCE, (*A. B.*, *University of California*, 1875).
 ERNEST GOTTLIEB SIBLER, (*Concordia*, 1869).

1879.

DOCTORS OF PHILOSOPHY.

- MAURICE BLOOMFIELD, (*A. M.*, *Furman*, 1877).
 SAMUEL FESSENDEN CLARKE, (*Ph. B.*, *Yale*, 1878).
 GEORGE BRUCE HALSTED, (*A. B.*, *Princeton*, 1875).
 EDWARD HART, (*S. B.*, *Lafayette*, 1874).
 WILLIAM WHITE JACQUES, (*S. B.*, *Mass. Inst. of Techn.*, 1876).
 HENRY SEWALL, (*S. B.*, *Wesleyan*, 1876).

BACHELORS OF ARTS.

- GEORGE WASHINGTON MCCREARY,
 CHASE PALMER,
 EDWARD HENRY SPIEKER.

1880.

DOCTORS OF PHILOSOPHY.

- FRANCIS GREENLEAF ALLINSON, (*A. B.*, *Haverf.*, 1876; *A. B.*, *Harv.* 1877).
 FABIAN FRANKLIN, (*Ph. B.*, *Columbian*, 1869).
 EDWIN HERBERT HALL, (*A. B.*, *Bowdoin*, 1875).
 ALLAN MARQUAND, (*A. B.*, *Princeton*, 1874).
 WASHINGTON IRVING STRINGHAM, (*A. B.*, *Harvard*, 1877).

BACHELORS OF ARTS.

- | | |
|----------------------------|--------------------------|
| THOMAS MILTON BEADENKOPF, | STEWART BRIAN LINTHICUM, |
| ALLEN KERR BOND, | JOHN HANSON LOWE, |
| WILLIAM CATHCART DAY, | LEIGH CLINTON MORGAN, |
| HENRY LAURENCE GANTT, | NELSON PALMER, |
| EDGAR GOODMAN, | THOMAS PETTIGREW, |
| CARL ECKHARDT GRAMMER, | HARRY FIELDING REID, |
| ALEXANDER FRIDGE JAMIESON, | WILTZ RAYMOND STRICKLEN, |
| EDMUND ALLEN JARVIS, | LEWIS WEBB WILHELM. |

D.

Enumeration of Classes which have been instructed during the Academic Year, 1879-80.

The following lists show the principal classes which have been organized and instructed during the year :

Mathematics. (31 Students.)

THEORY OF NUMBERS (8). *Twice weekly, through the year: Prof. Sylvester.*

MATHEMATICAL SEMINARY (15). *Once monthly, through the year: Prof. Sylvester and Dr. Story.*

QUATERNIONS (4). *Thrice weekly, through the year: Dr. Story.*

ELLIPTIC FUNCTIONS (4). *Thrice weekly, through the year: Dr. Story.*

HIGHER PLANE CURVES (5). *Four times weekly, first half year: Dr. Story.*

SOLID ANALYTIC GEOMETRY (4). *Four times weekly, second half year: Dr. Story, assisted by the Fellows in Mathematics.*

DIFFERENTIAL EQUATIONS (8). *Thrice weekly, through the year: Dr. Story.*

CALCULUS OF VARIATIONS (9). *Twelve Lectures: Dr. Craig.*

SPHERICAL HARMONICS (6). *Twenty Lectures: Dr. Craig.*

CYLINDRIC OR BESSEL'S FUNCTIONS (2). *Ten Lectures: Dr. Craig.*

GENERAL THEORY OF FUNCTIONS (2). *Thirty Lectures: Dr. Craig.*

DIFFERENTIAL AND INTEGRAL CALCULUS (9). *Thrice weekly, through the year: Dr. Franklin.*

CONIC SECTIONS (8). *Thrice weekly, through the year: Dr. Franklin: —Instruction given chiefly by lectures from notes prepared by Dr. Story.*

THEORY OF EQUATIONS (6). *Twice weekly, through the year: Dr. Franklin.*

The results of special studies upon the following subjects, among others, have been examined and discussed in the Mathematical Seminary, under the direction of Prof. Sylvester and Dr. Story :

A generalized form of analytical triangle; on vector ratios considered as trigonometric functions of angles; on the condition that a linear total differential equation of the first order in any number of variables may admit of a single primitive; a generalization, for n -fold space, of Euler's equation for polyhedra; a completion of Fermat's theorem; on generalized forms of trigonometric ratios; on volumes and surfaces of n -dimensional spheres; on triangles in- and ex-scribable to a general cubic curve; on binomial congruences; rotation in four-dimensional space; a general method of congruences, and its application to the theory of cyclotomic functions; completion of Wilson's theorem, and on the number of n th residues. Abstracts of these papers have been printed in the University Circulars.

Physics. (38 Students.)

GENERAL PHYSICS [Elementary Mechanics, Acoustics and Heat, first half year; Magnetism, Electricity and Light, second half year] (15).

Daily lectures and exercises, through the year: Dr. Hastings.

THERMODYNAMICS (6). *Thirty lectures and eight conferences: Prof. Rowland.*

ELECTRICITY AND MAGNETISM (3). *Twenty lectures and five conferences: Prof. Rowland.*

THEORY OF HEAT CONDUCTION (5). *Three lectures and one conference, weekly, second half year: Prof. Rowland.*

RATIONAL MECHANICS (10). *Four times weekly, January and February: Prof. Gibbs, of Yale College.*

LABORATORY WORK FOR ADVANCED SPECIAL STUDENTS (10). *Daily, through the year: Prof. Rowland.*

PHYSICAL SEMINARY (17). *Saturdays, through the year: Dr. Hastings.*

READING AND DISCUSSION OF CURRENT PHYSICAL JOURNALS (9). *Once weekly, through the year.*

PHILOSOPHY OF PHYSICS. *Twelve public lectures: Prof. Trowbridge, of Harvard University.*

The researches carried on in the Physical Laboratory, by the Fellows and advanced students under the direction of Prof. Rowland, included the following subjects:

The comparison of the electrical resistance with the expansion of a platinum wire at all temperatures up to a white heat; the electric absorption of crystals; the new action of magnetism on an electric current; the determination of the mechanical equivalent of heat by electrical means, using the coil whose absolute resistance was determined here some years ago; the effect of dissolved gases on the expansion of water; the action of magnetism on light; etc.

The work of the Physical Seminary has included: (a)—solution of problems and criticism of results (once weekly, through the year); (b)—five lectures on the laws of probability as applied to the discussion of observations, with examples; (c)—for advanced students, weekly lectures on selected problems in applied mathematics; (d)—problems of various orders of difficulty which have been assigned and full reports demanded. A series as complete as possible was framed for those who were striving to meet the requirements of a major course. Other students have given special attention to a particular field—for example, one of the Fellows has devoted his attention largely to electricity and magnetism; another to light (and in one of his reports he has given a new and brief solution of the problem of minimum deviation in the prism, which will be published in the *American Journal of Mathematics*). One of the special students, by a careful investigation, has determined the equations of the standard meter belonging to the University, thus rendering it useful for the most exact work.

Chemistry. (46 Students.)

GENERAL CHEMISTRY (21). *Four lectures by Prof. Remsen, and two examinations by Dr. Morse, weekly, first half year.*

GENERAL CHEMISTRY (continued) (9). *Four lectures and two examinations weekly, second half year : Dr. Morse.*

ORGANIC CHEMISTRY (20). *Four lectures weekly, second half year : Prof. Remsen.*

ANALYTICAL CHEMISTRY (15). *Three times weekly, first half year : Dr. Morse.*

LABORATORY WORK (85). *Four to eight hours daily, through the year : Prof. Remsen and Dr. Morse, and Dr. L. B. Hall.*

READING AND DISCUSSION OF CURRENT CHEMICAL JOURNALS (9). *Twice weekly, through the year.*

The Fellows and advanced students have also been engaged daily in the laboratory in following out various investigations, mostly under the direction of Prof. Remsen. The principal of these are : On the comparison of sulphonic acids from different sources; sulphoterephthalic acid; sulphoisophthalic acid; the oxidation of nitroxylenes; the oxidation of substitution-products of paradiethylbenzene; toluenedisulphonic acid and its derivatives; the oxidation of substitution-products of mesitylene; and the conduct of some unsaturated compounds.

Biology. (32 Students.)

ANIMAL PHYSIOLOGY (11). *Twice weekly, through the year : Prof. Martin.*

GENERAL BIOLOGY (18). *Four times weekly, through the year : Prof. Martin.*

ANIMAL MORPHOLOGY (4). *Four times weekly, first half year : Dr. Brooks.*

OSTEOLOGY, HUMAN AND COMPARATIVE (11). *Twice weekly, through the year : Dr. Brooks.*

HISTOLOGY (11). *Special course in laboratory : Dr. Sihler.*

SPECIAL RESEARCHES IN LABORATORY (8). *Through the year : Prof. Martin and Dr. Brooks.*

LABORATORY INSTRUCTION, in connection with the lecture courses (23). *Through the year : Prof. Martin, Drs. Brooks, Sihler and Clarke.*

STRUCTURE, ETC., OF THE CRAB AND THE OYSTER. *Three public lectures : Dr. Brooks.*

DEMONSTRATIONS IN PHYSIOLOGY TO MEDICAL STUDENTS (16). *Eighteen lectures with experiments : Prof. Martin.*

PRACTICAL INSTRUCTION IN HISTOLOGY TO MEDICAL STUDENTS (4). *Eighteen lectures, with laboratory work : Dr. Sihler.*

During the year investigations have been carried on in the laboratory on the following subjects, and articles based on them have either been already published or will shortly be :—Influence of stimulation of anterior

spinal roots on reflex excitability of the spinal cord; on heat dyspnoea; the influence of quinine on the heart and spinal cord; the nature of the inflammatory changes in Keratitis; does a transference of solid particles from maternal to foetal blood take place?; the structure and significance of the gills of Yoldia, Cyclas and Modiola; the development of Amblystoma punctatum (continued); the embryology of the earth-worm.

During the summer of 1880, the Chesapeake Zoölogical Laboratory for the study of forms of marine life was conducted by Dr. Brooks at Beaufort, N. C. A class for beginners was also taught at Fort Wool by Dr. Clarke.

Greek. (36 Students.)

PINDAR (7). *Twice weekly, through the year: Prof. Gildersleeve.*

GREEK LYRIC POETRY (8). *Once weekly, through the year: Prof. Gildersleeve.*

GREEK SEMINARY (11). *Twice weekly, through the year: Prof. Gildersleeve.*

GREEK COMPOSITION AND TRANSLATION (18). *Twice weekly, for three months: Prof. Gildersleeve.*

ÆSCHYLUS, SOPHOCLES AND EURIPIDES (9). *Six readings: Prof. Gildersleeve.*

SYNTAX OF GREEK COMPOUND SENTENCE (9). *Second half year: Prof. Gildersleeve.*

GREEK TRAGIC POETS. *Nine public lectures: Prof. Gildersleeve.*

ARISTOTLE, Rhetoric (12). *Thrice weekly, first half-year: Prof. C. D. Morris.*

PLATO, Georgias, Meno (8). *Four times weekly, second half-year: Prof. C. D. Morris.*

HOMER, Odyssey (6). *Four times weekly, first half-year: Prof. C. D. Morris.*

LYSIAS, Oration, vii, xii, xvi, xxv; ISOCRATES, Oration, i, ix (6). *Four times weekly, second half year: Prof. C. D. Morris.*

GREEK PROSE COMPOSITION (18). *Once weekly, through the year: Prof. C. D. Morris.*

NEW TESTAMENT GREEK (8). *Thrice weekly, through the year: Mr. Cross.*

NEW TESTAMENT EXEGESIS (5). *Once weekly, through the year: Mr. Cross.*

EXEGESIS OF THE GOSPELS. *Fifteen lectures: Mr. Cross.*

Students have privately read for examination:

ARISTOPHANES, Frogs (2); Plutus (1); Knights (1).

THUCYDIDES, bk. iv (1); bks. i, iv (1); bk. i (1).

DEMOSTHENES, De Corona (1).

HERODOTUS, bks. v-ix (1); bk. v (1); bk. i (1).

EURIPIDES, Alcestis (1); Hippolytus (1); Ion, Bacchae (2).

HOMER, Odyssey, bks. i, vi (4); Iliad, bks. i-vi (2); Iliad, bks. vii-xii (2).

During the session of 1879-80, the centre of work in the Greek Seminary was Aristophanes, and the play selected for special study was the *Wasps*. The members of the seminary were required to present in turn an exegetical and critical commentary of a portion of this comedy, and this work constituted a regular weekly exercise. In order to secure a wider knowledge of the author, cursory readings were also instituted in the other plays, which were in like manner assigned to certain students, charged with the duty of preparing the historical introduction and the analysis. In this way nearly all the members of the seminary were made acquainted with the bulk of Aristophanes, and some of them followed besides a course of study in the fragments of the comic poets. Among the more elaborate papers, which were the fruit of this work in Aristophanes, may be mentioned the following: On the Tropology of Aristophanes; on the genitive case in Aristophanes; on the infinitive in Aristophanes; on the distribution of the *choreutai* in the *Wasps*.

Latin. (40 Students.) *Dr. Warren.*

PLAUTUS (18). *Once weekly, through the year.*

HISTORICAL LATIN GRAMMAR (15). *Twelve lectures.*

TERENCE, *Hautontim.*, *Adelphi*; PLAUTUS, *Aulularia* (14). *Four times weekly, first half year.*

LUCRETIUS, bks. i, iii, v (10). *Four times weekly, second half year.*

HORACE (18), *Four times weekly, first half year.*

LIVY, bks. xxi, xxii (18). *Four times weekly, second half year.*

LATIN PROSE COMPOSITION (14). *Once weekly, through the year.*

Students have privately read for examination:

TERENCE, *Eunuchus*, *Phormio*, *Andria*, *Hecyra*, (2); *Adelphi*, *Hautontim.* (2); *Hautontim.* (1); *Andria* (1).

TACITUS, *Germania*, *Agricola* (2); *Historiae*, bks. i, ii (1), *Historiae*, bks. ii-v (2); *Annals*, bk. vi (1).

JUVENAL, *Satires* (2).

PLAUTUS, *Mostellaria* (1).

CICERO, *Orator* (2); *de Officiis* (1).

LIVY, bks. ii-vii (1).

VIRGIL, *Aeneid*, bks. i-xii (1); bks. i-vi (1).

HORACE, *Odes*, *Epodes*, *Satires*, *Ars Poetica* (1); *Satires*, *Epistles* (1); *Epodes* (1).

CÆSAR, *Bell. Civ* (1).

Sanskrit. (8 Students.) *Dr. Lanman.*

HYMNS OF THE RIG AND ATHARVA-VEDAS (1). *Twice weekly, through the year.*

ADVANCED SANSKRIT [*Kathā-sarit-sāgara*, *Proverbs*, *Veda*] (2). *Twice weekly, through the year.*

ELEMENTARY SANSKRIT (5). *Twice weekly, through the year.*

THE VEDAS. *Six public lectures.*

German. (60 Students.) *Mr. Brandt.*

GOETHIC [Ulfila] (2). *Twice weekly, first half year.*

MIDDLE HIGH GERMAN [Nibelungenlied] (1). *Once weekly, second half year.*

MIDDLE HIGH GERMAN [Minnesinger; Hartmann, *Der arme Heinrich*; Lectures on Grammar and Middle High German Literature (8). *Twice weekly, second half year.*

GERMAN PROSE COMPOSITION [Essays; Lectures on Historical Grammar; Dictations from English into German] (17). *Once weekly, through the year.*

LECTURES ON GERMAN BALLADS (17). *Once weekly, October to April.*

GOETHE, Faust, part i (14). *Once weekly, April to June.*

LESSING, Nathan der Weise (14). *Once weekly, first half year.*

HUMBOLDT, Ansichten der Natur; SCHILLER'S AND LESSING'S Prosa (10). *Twice weekly, through the year.*

MINOR COURSE, Class B, First Division [Bluntschli, *Völkerrecht*; Goethe's and Lessing's *Prosa*; Goethe, *Egmont*; Bernstein, *über Humboldt*; Schiller's Minor Poems; Lectures on comparative study of English and German; Exercises, etc.] (18). *Five times weekly through the year.*

MINOR COURSE, Class B, Second Division [Schiller, *Neffe als Onkel*; Exercises; Grammar] (12). *Thrice weekly, first half year.*

MINOR COURSE [Hodges' *Scientific German*] (6). *Twice weekly, second half year.*

Students have read privately for examination :

SCHILLER, Wilhelm Tell (8); Neffe als Onkel (1).

LESSING, Minna v. Barnhelm (2); Laokoön (1).

GOETHE, Prosa (8).

HUMBOLDT, Ansichten der Natur (8).

SCIENTIFIC GERMAN (2).

GERMAN, Minor Poems (1).

English. (19 Students.) *Mr. Cook.*

OLD SAXON, [Heliand] (2). *Twice weekly, second half year.*

EARLY ENGLISH, Advanced Class (1). *Once weekly, second half year.*

ANGLO SAXON, Advanced Class (1). *Thrice weekly, first half year.*

ANGLO-SAXON, Elementary Class (11). *Twice weekly, second half year.*

CHAUCER [The Prioresses Tale, Sir Thopas, The Squires Tale] (4). *Seven expository readings.*

ANGLO-SAXON LAWS (5). *Seven recitations.*

SHAKESPEARE, Class A (7). *Daily, first half year.*

SHAKESPEARE, Class B (6). *Twice weekly, first half year.*

ENGLISH VERSE, especially Shakespeare's. *Sixteen public lectures : Mr. Lanier.*

Romance Languages. (39 Students.)

ROMANCE DIALECTS (8). *Lectures once weekly, through the year: Mr. Elliott.*

PROVENÇAL [Girart de Rossilho; Marcabrun; Peire Vidal; Bertran de Born; Folquet de Marseille; Raimbaut de Vaqueiras; Guiraut de Borneil] (8). *Once weekly, through the year: Mr. Elliott.*

WALLACHIAN [Alecsandri (Vasile), *Hora de la Plevna*; *Hora de la Grivita*, *La Turnu-Măgurele*; extracts from the writings of Sionu, Alecsandrescu, Boliacu, Muresianu] (8). *Once weekly, through the year: Mr. Elliott.*

FRENCH, Advanced Course [Chanson de Roland; Lois de Guillaume le Conquérant; Alexandre d'Alberic de Besançon; Garin le Loherain; Amis et Amiles; Guillaume d'Orenge; Renaut de Montauban; Le Roman de Brut (Wace)] (8). *Once weekly, through the year: Mr. Elliott.*

FRENCH, Major Course [Lectures on the distribution of the Romance Languages; Villehardoin, *La Conquête de Constantinople*; Aucassin et Nicolette; Adenet Le Roi, *Berte au grand pied*; Marie de France, *Lais*; Fables; Brachet, *Grammaire Historique*] (7). *Twice weekly, through the year: Mr. Elliott.*

FRENCH, Minor Course, Class A [De Musset, *Un Caprice*; Feuillet, *Roman d'un jeune homme pauvre*; Balzac, *Père Goriot*; Racine, *Plaideurs*; Voltaire, *Mérope*; Molière, *Tartufe*; Translating English into French; Grammars (in French) (Ploetz; Brachet), etc.] (14) *Daily, through the year: Mr. Elliott and Mr. Garner.*

FRENCH, Minor Course, Class B [Keetels' *Analytical French Reader*, p't ii; Scribe, *La Bataille de Dames*; De Maistre, *Voyage autour de ma chambre*; Töpffer, *Mésaventures d'un écolier*; Villemain, *Las-caris*; Fiévée, *La Dot de Suzette*; About, *Les Jumeaux de l'Hôtel Corneille*; Poetical Selections from Hugo, Lamartine, etc.; Exercises; Grammar; etc.] (11). *Daily, through the year: Mr. Elliott and Mr. Garner.*

SCIENTIFIC FRENCH, Saturday Class [Bréal, *Les Idées Latentes du Langage*; Hovelacque, *Notre Ancêtre*] (14). *Once weekly, second half year: Mr. Elliott and Mr. Garner.*

FRENCH, Conversation Class (7). *Thrice weekly, through the year: M. Rabillon.*

FRENCH EPIC POETRY, especially the Chanson de Roland. *Twelve public lectures in French: M. Rabillon.*

FRENCH LITERATURE. *Twelve public readings in French: M. Rabillon.*

History and Political Science. (33 Students.)

SEMINARY OF AMERICAN HISTORY (15). *Once weekly, two months:*
Dr. Scott.

COMPARATIVE CONSTITUTIONAL HISTORY (5). *Once weekly, four months:* *Dr. H. B. Adams.*

HISTORY OF THE RENAISSANCE AND REFORMATION (17). *Daily, first half year, also ten public lectures:* *Dr. H. B. Adams.*

ENGLISH CONSTITUTIONAL HISTORY [Stubbs's *Select Charters*] (15).
Once weekly, six months: *Dr. H. B. Adams.*

POLITICAL ECONOMY (18). *Four times weekly, two months:* *Dr. H. B. Adams.*

MONEY AND BANKING (12). *Four times weekly, two months:* *Dr. H. C. Adams.*

NATIONAL DEBTS. *Nine public lectures:* *Dr. H. C. Adams.*

Logic. (16 Students.) *Mr. Peirce.*

GENERAL COURSE, (14). *Thrice weekly, six months.*

MEDIAEVAL LOGIC (5). *Once weekly, three months.*

PROBABILITIES (4). *Once weekly, two months.*

MILL'S LOGIC (8). *Once weekly, three months; twice weekly, one month;*
Mr. Marquand.

History of Philosophy and Ethics. (12 Students.)

Prof. G. S. Morris.

HISTORY OF BRITISH PHILOSOPHY (12). *Three times weekly, second half year.*

GERMAN AESTHETICS (2). *Once weekly, second half year.*

BRITISH THOUGHT AND THINKERS. *Twelve public lectures.*

ETHICS (5). *Once weekly, second half year.*

Classes have also been instructed in Physiography, Drawing, Elocution, etc.

E.**System of Fellowships.**

Twenty Fellowships, each yielding five hundred dollars, are annually open to competition in this University.

OBJECT OF THE FOUNDATION.

The system of Fellowships was instituted for the purpose of affording to young men of talent from any place, an opportunity to continue their studies in the Johns Hopkins University, while looking forward to positions as professors, teachers, and investigators, or to other literary and scientific vocations. The appointments have not been made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the Fellowships are not so much honors and prizes bestowed for past achievements, as helps to further progress, and stepping-stones to honorable intellectual careers. They have not been offered to those who are definitely looking forward to the practice of either of the three learned professions, (though such persons have not been formally excluded from the competition,) but have been bestowed almost exclusively on young men desirous of becoming teachers of science and literature, or determined to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician and the minister.

Every candidate is expected to submit his college diploma or other certificate of proficiency from the institution where he has been taught, with recommendations from those who are qualified to speak of his character and attainments. But this is only introductory. He must also submit, orally or in writing, such evidence of his past success in study, and of his plans for the future, together with such examples of his literary or scientific work, as will enable the Professors to judge of his fitness for the post. The examination is indeed in a certain sense competitive; but not with uniform tests, nor by formal questions and answers submitted to the candidates. First, the head of a given department considers, with such counsel as he may command, the applicant's record. The Professors then collectively deliberate on the nominations made by individual members of their body. The list upon which they agree, with the reasons for it, is finally submitted by the President of the University to the Executive Committee, and by them to the Trustees for final registration and appointment. By all these precautions, the highest results which were anticipated have been secured. A company of most promising students has been brought together, and their ability as teachers and scholars has been recognized by the calls they have received to permanent and attractive posts in different parts of the country.

NOTE.—The number of applications for Fellowships has been very large, and it may have happened that some candidates have failed of

appointment who were really superior to those selected. But if so, this has resulted from the fact, that a considerable number of applicants have each year forwarded to the University merely testimonials from their instructors without any such examples of their own work as have been mentioned above; and in consequence, the Professors, from want of adequate knowledge, have been compelled to pass over candidates who may have been in the highest degree meritorious.

It is obvious from the nature of the case that Graduate Students residing in Baltimore must have better opportunities than others of making known their powers to the appointing board; but, as the list below will show, the absence of a candidate from Baltimore has been no bar to his appointment, in cases where adequate evidence of his claims has been presented.

Summary.

At the opening of the University, 22 Fellows were appointed; of the 44 since appointed, 22 commenced their career here as Graduate Students.

Fellowships have been awarded in the following departments of study: Mathematics and Physics, 18, (including 2 in Engineering); Chemistry, 18, (including 1 in Mineralogy); Biology, 12; Languages, 14, (including 9 in Greek); History and Philosophy, 9.

Of the 46 who have left, 28 have gone forward to honorable positions as Instructors in Colleges and other institutions of a high character; 2 are attached to the United States Coast Survey, and 2 to the Metropolitan Museum of Art, New York; 4 are engaged in the application of science to practical work; 2 are Physicians, 1 is an Attorney at Law, and 4 are still pursuing their studies here or abroad.

Those appointed as Fellows had received the Baccalaureate degree at the following institutions:

Amherst College,	5	Mass. Inst. of Technology,	1
Bowdoin College,	2	Michigan, University of,	2
California, University of,	1	Pennsylvania, University of,	1
Columbia College,	1	Princeton College,	3
Columbian University,	1	Randolph-Macon College,	1
Cornell University,	4	Rensselaer Polytechnic Inst.,	1
Davidson College,	1	Rochester, University of,	1
France, University of,	1	Rutgers College,	2
Furman University, (S. C.)	1	South Carolina, University of,	1
Harvard University,	4	Stevens Inst. of Technology,	2
Haverford College,	1	Tokio, University of, (Japan)	1
Iowa College,	1	Virginia, University of,	5
Johns Hopkins University,	2	Wesleyan University,	1
Lafayette College,	3	Williams College,	3
Marietta College,	1	Yale College,	7

TERMS AND REGULATIONS.

1. The application must be made in writing.
2. The candidate must give evidence of a liberal education, such as the diploma of a college of good repute; of decided proclivity towards a special line of study, such as an example of some scientific or literary work already performed; and of upright character, such as a testimonial from some instructor.
3. The value of each Fellowship will be five hundred dollars. In case of resignation, promotion, or other withdrawal from the Fellowship, payments will be made for the time during which the office may have been actually held.
4. Every holder of a Fellowship will be expected to render some services to the institution as an examiner, to give all his influence for the promotion of scholarship and good order, and in general to co-operate in upholding the efficiency of the University, as circumstances may suggest. He must reside in Baltimore during the academic year.
5. He will be expected to devote his time to the prosecution of special study, (not professional) with the approval of the President, and before the close of the year, to give evidence of progress by the preparation of a thesis, the completion of a research, the delivery of a lecture, or by some other method.
6. He may give instruction, with the approval of the President, by lectures or otherwise, to persons connected with the University,—but he may not engage in teaching elsewhere.
7. He may be re-appointed at the end of the year.
8. The appointments for 1880–81, were as follows:
In Mathematics, four; Languages, five; Chemistry, three; Physics, three; Biology, three; Philosophy, two.
9. *Applications for the next year should be made prior to May 18, 1881.*

F.

Report of Chesapeake Zoölogical Laboratory.

FOR THE THIRD YEAR.

Summer of 1880, Beaufort, N. C.

To the President of the Johns Hopkins University:

DEAR SIR: In accordance with your request I have the honor to submit the following report of the Third Session of the Chesapeake Zoölogical Laboratory.

By the liberality of the Trustees, I have been enabled to spend a much longer period than hitherto at the seaside, and have been provided with a more liberal outfit, including a steam launch which was built, for our use in the last spring, at Bristol, R. I., and has proved a very efficient auxiliary. The necessary books, dredges, and other instruments were also provided by the University. In addition to the opportunities afforded to three of the members of our own academic staff, three other gentlemen, devoted to the study of Zoölogy, were invited to avail themselves of the scientific facilities of the station.

The laboratory was opened at Beaufort, N. C., on April 23, 1880, and closed on September 30, after a session of twenty-three weeks. It was supplied with working accommodations for six investigators, and the facilities which it afforded were used by the following six persons:

- ✓ W. K. BROOKS, PH. D.
Director.
- ✓ K. MITSUKURI, PH. B.
Fellow in Biology.
- ✓ E. B. WILSON, PH. B.
Fellow in Biology.
- F. W. KING, A. M.
Professor of Natural Science, Wisconsin State Normal School.
- H. C. EVARTS, M. D.
Academy of Natural Sciences, Philadelphia.
- / H. F. OSBORNE, PH. D.
Fellow of the College of New Jersey.

Beaufort was selected for our third season's work because it is the nearest accessible town, south of Baltimore, which is favorably situated for zoölogical study. The advantages of a location in a town are well shown by the fact that the expenses of a session of twenty-three weeks this year were considerably less than those of a ten weeks session the year before.

The scientific advantages of Beaufort are very great; the most important is the great difference between its fauna and that of our northern Atlantic coast.

The configuration of our coast line is such that Cape Hatteras, the most projecting point south of New York, deflects the warm water of the Gulf Stream away from the coast, and thus forms an abrupt barrier between a cold northern coast and a warm southern one. The fauna north of this barrier passes gradually into that of southern New England, while the fauna south of the barrier passes without any abrupt change into that of Florida, but the northern fauna is sharply separated by Cape Hatteras from the southern.

As the laboratory of the U. S. Fish Commission and Mr. Agassiz's laboratory at Newport afford opportunities for work upon the northern fauna, it seemed best for us to select a point south of Cape Hatteras in order to study the southern fauna with the same advantages, and as Beaufort is the only town near the Cape which can be reached without difficulty, it was chosen as the best place for the laboratory.

The situation of this town is exceptionally favorable for zoölogical work, for the surrounding waters present such a diversity of conditions that the fauna is unusually rich and varied.

Close to the town there are large sand bars, bare for miles at low tide, and abounding in animal life. From these we could collect an unfailing supply of *Amphioxus*, *Renilla*, *Limulus*, *Balanoglossus*, Sea Urchins, and a great variety of Molluscs and Crustacea.

The mud flats furnished us with another fauna, and yielded a great variety of Annelids, a new set of species of Crustacea and Molluscs, Gephyreans, Echinoderms, and Polype. The large salt marshes gave us a third fauna, and a short distance inland large swamps of brackish and fresh water furnished still other conditions of life.

As the town is situated at the point where Gore Sound connects Pamlico Sound with Bogue Sound we were within easy reach of a continuous sheet of landlocked salt water more than a hundred miles long, and these Sounds furnished still another collecting and dredging ground, abounding in Corals, Gorgonias, Ascidians, Star Fish, Sea Urchins, and a new set of Molluscs and Crustacea.

As most of the shores are flat and sandy those animals which live upon a sandy bottom are much more abundant than those which attach themselves to solid bodies, but the stone breakwaters at Fort Macon, the wharves at Beaufort and Morehead City, and the large oyster beds which are found in the sounds furnish a proper habitat for many fixed animals, and yielded us a rich supply of Hydroids, Corals, Ascidians, Sea Anemones, Sponges, Cirrhipeds, &c. The ocean beach within a short distance of the town furnished still another fauna, and a sail of three miles from the laboratory carried us to a good locality for ocean dredging.

The greatest advantage of the locality is the richness of its pelagic fauna. There are very few points upon land which are so situated that the surface

animals of mid-ocean can be procured in abundance for laboratory work, and as careful work is very difficult on shipboard, a laboratory which can be furnished with a good supply of living pelagic animals presents opportunities for work in an extremely interesting and almost new field.

The Gulf Stream is constantly sweeping these animals northwards along the North Carolina coast, and as the tide sets in through Beaufort Inlet into the Sounds the floating animals are carried with it. Such oceanic animals as *Physalia* and *Porpita* were frequently thrown, uninjured and in perfect health, upon the beach within twenty feet of the laboratory, and during the season we found nearly all the Siphonophoræ which are known to occur upon our Atlantic coast.

With all these advantages we enjoyed a mild and uniform climate which enabled us to work in perfect comfort during the hottest months of summer.

The zoological resources of Beaufort have not escaped the attention of American naturalists, and there are few places upon our coast, outside of New England, where more zoological work has been done. In 1860, Drs. Stimpson and Gill spent a season in dredging and collecting in the vicinity of Beaufort, Cape Lookout and Cape Hatteras, and an account of their work was published in the *American Journal of Science*. Dr. Coues, who was stationed at Fort Macon during the war, occupied himself for two years in collecting the animals which are found here, and he published a series of papers on the "Natural History of Fort Macon and Vicinity" in the *Proceedings of the Academy of Natural Sciences of Philadelphia*.

These papers, which were continued by Dr. Yarrow, contain copious and valuable notes on the habits and distribution of the animals which were observed, and we found them a great help to us. These two naturalists found four hundred and eighty species of animals in the vicinity of Beaufort. Of these four hundred and eighty, two hundred and ninety-eight are vertebrates, and one hundred and eighty-two are invertebrates. Of the vertebrates twenty-four are mammals, one hundred and thirty-three are birds, twenty-seven are reptiles, six batrachians, ninety-seven fishes and eleven selachians. Of the invertebrates one hundred and forty-seven are molluscs, twenty-one are crustaceans. The list of vertebrates is very nearly exhaustive, and we made no additions to it, but the list of invertebrates is obviously very imperfect, and, although we made no attempt to tabulate the species which we observed, there would be no difficulty in enlarging list the twenty or thirty fold.

Among other naturalists who have spent more or less time at Beaufort I may mention Professor L. Agassiz, Professor E. S. Morse, Dr. A. S. Packard, Professor Webster, and Professor D. S. Jordan. Professor Morse procured most of the material for his well known paper on the Systematic Position of the Brachiopoda on the sand bars in Beaufort Inlet.

I will now attempt to give a very short statement of some of the leading points in our own summer's work. Much of our time was spent

in studying the development of the Crustacea, since this is one of the most important fields for original work upon our southern coast. The supply of material is almost inexhaustible, and would employ a number of students for many years. The life history of the Crustacea is of great interest in itself, and the recent species are so numerous and diversified that there is no group of animals better adapted for studying the general laws of embryonic development in their relation to the evolution of the group.

These considerations have led us to devote especial attention to this group during this and the preceding seasons. One of the published results of the first season's work was an illustrated account of the metamorphosis of *Squilla*, a representative of a somewhat aberrant group of Crustacea. During the second season, a member of our party, Professor Birge, made a very thorough study of the development of *Panopeus*, one of our crabs, and the account of his observations, with drawings, was ready for publication several months ago. At Beaufort, we spent most of our time upon this subject, and figured more than eight hundred points in the development of various Crustacea.

Among these, I wish to call especial attention to our observations upon the development of the Sergestidae; the least specialized of the stalk-eyed Crustacea. This very peculiar group was not known to occur upon our coast until we found a few specimens of one genus at Fort Wool, and the same genus—*Lucifer*—in great abundance at Beaufort, associated with another genus which is also new to North America. As nothing whatever was known of the development of *Lucifer*, we made every effort to obtain the eggs and young, and after four months of almost fruitless labor we finally succeeded in finding all the stages of the metamorphosis, and figured them in a complete series of ninety-nine drawings. We also obtained a somewhat less complete series of figures of stages in the life history of the second Sergestid.

Our only motive in this work was the desire to fill a gap in our knowledge of crustacean development, by supplying the life history of a very interesting group of animals, but the result was found to have a very unexpected value, since it contributes to the discussion of a number of problems in general embryology and morphology, and is the most significant crustacean life history which has ever been studied.

The following are some of the more important points:

The egg undergoes total regular segmentation.

There is no food yolk, and cleavage goes quite through the egg.

There is a true segmentation cavity.

Segmentation is rhythmical.

There is an invaginate gastrula.

The larva leaves the egg as a Nauplius, and passes through a protozoa stage, and a schizopod stage.

The fifth thoracic segments and appendages are entirely wanting at all stages of development.

Another interesting group which was studied is the Porcellanidae; the least specialized of the true crabs. The adults of our American species are almost restricted to our southern waters, although the swimming larvae are carried north by the Gulf Stream. Within the last two years two northern naturalists have studied these floating embryos upon the south coast of New England, but as they were working upon stragglers so far from home their accounts are incomplete and somewhat contradictory. Our advantages at Beaufort enabled us to contribute towards the solution of this confused subject by raising one species of *Porcellana* from the egg.

We also raised six other species of crabs from the egg, and made drawings of the more important stages of development. One of the species which was thus studied is the edible crab. Its metamorphosis has never been figured, and although it presents no unusual features, its economic importance gives value to exact knowledge of its life history.

Mr. Wilson also studied the development of one species of *Pycnogonida*, a group of very peculiar Arthropods, distantly related to the spiders. As he has paid especial attention to the systematic study of this group, and is now engaged in describing the *Pycnogonids* collected in the Gulf Stream by Mr. Agassiz, the opportunity to study them alive in the laboratory has been a great advantage to him.

Another important investigation is the study, by Mr. Wilson, of the embryology of the marine Annelids. Although the representatives of this large group are abundant and widely distributed, little was known of the early stages of their development until he procured the eggs of several species and studied them at Beaufort. This investigation has shown, among other things, that the accepted division of Annelids into two great groups, the *Oligochæta* and *Polychæta*, is not a natural method of classification. The work upon the development of marine Annelids was supplementary to an investigation which Mr. Wilson carried on last spring at Baltimore, and which he will continue this winter, upon the development of land and fresh water Annelids.

As much time as possible was given this season to the study of the hydroids and jelly-fish of Beaufort. The life history of several of them were investigated, a thorough anatomical study of some of the most important forms was carried on, and nearly two hundred drawings were made. It is almost impossible to complete a study of this kind in a single season, but if one or two more summers can be given to the work, we have every reason to hope for valuable results, for although the North Carolina coast is the home of many species which are only found as stragglers upon our northern coast, and of other species which are not known to occur anywhere else, and of some genera and families which are new to the North American coast, this field has suffered almost total neglect.

Nearly three months of the time of two members of our party, Mitsukuri and Wilson, were given to the study of the habits, anatomy and

development of *Renilla*, a compound Polyp very much like that which forms the precious coral, but soft and without a stony skeleton. The animals which form the community are so intimately bound together that the community, as a whole, has a well marked individuality, distinct from that of the separate animals which compose it. The compound individuality of *Renilla* is quite rudimentary as compared with that of a Siphonophore, and as there is no trace of it in the closely allied *Gorgonias*, it furnishes an excellent field for studying the incipient stages in the formation of a compound organism by the union and specialization of a community of independent simple organisms. With this end in view the anatomy of the fully developed community was carefully studied, and the formation of a community was traced by rearing a simple solitary embryo in an aquarium until a perfect community had been developed from it by budding. During the process of development the law of growth by which the characteristics of the compound organism are brought about was very clearly exhibited, and it is fully illustrated by nearly one hundred drawings.

One of the most interesting results of our work is the explanation by Mr. Wilson, of the origin of the metamorphosis of the larva of *Phoronis*, a small Gephyrean worm which lives in a tube. Several of the most noted embryologists of Europe have studied the development of *Phoronis*, and our knowledge of its life history is due to their combined labors. Last summer Mr. Wilson reviewed the subject, and added some important points, and during the present season he has shown by the comparison of a great number of allied forms, that the very peculiar metamorphosis admits of an extremely simple explanation. The adult is sedentary and confined to its sand tube, while the larva is a swimming animal totally different in structure. The change from the larva to the adult is very rapid and violent. It occupies only a few minutes, and during the change the larva becomes turned wrong side out, so that what was internal is external. Mr. Wilson's comparison shows that *Phoronis* was originally a free animal, and that the structural peculiarities which fit the adult for sedentary life in a tube are of recent acquisition. The larva has however retained its ancestral adaptation to a swimming life in order to provide for the distribution of the species. There must have been a time, in the evolution of the species, when the adult was imperfectly adapted to a sedentary life, and also imperfectly adapted to a swimming life, and if the development of the individual were a perfect recapitulation of all the stages in the evolution of the species, we should have, between the swimming larva and the sedentary adult, a stage of development during which the adaptation is not quite perfect for either mode of life. It is clearly an advantage for the animal to pass through this stage as quickly as possible, or to escape it altogether. The peculiar metamorphosis enables the larva to remain perfectly adapted to a locomotor life until the occurrence of the sudden change which fits it for life in a tube, and Mr. Wilson has pointed out the manner in which the metamorphosis

has been acquired in order to bridge over the period of imperfect specialization. This explanation is somewhat similar to that which Lubbock has given of the origin of the metamorphosis of insects, and we may hope that the same method of investigation will throw light upon the significance of other remarkable instances of metamorphosis in the invertebrates.

During the summer, the following abstracts of some of the more important points in our work have been published in scientific journals:

The Development of the Cephalopoda and the Homology of the Cephalopod Foot. By W. K. BROOKS. *Amer. Journal of Science*.

The Development of Annelids. By E. B. WILSON. *Amer. Journal of Science*.

The Rhythmical Nature of Segmentation. By W. K. BROOKS. *Amer. Journal of Science*.

The Origin of the Metamorphosis of Actinotrocha. By E. B. WILSON. *Amer. Assoc., Boston Meeting*.

Notes on the Medusae of Beaufort. By W. K. BROOKS. *Amer. Assoc., Boston Meeting*.

Budding in Free Medusae. By W. K. BROOKS. *Amer. Naturalist*.

Development of Marine Polychæteous Annelids. By E. B. WILSON. *Zoologischer Anzeiger*.

Embryology and Metamorphosis of Lucifer. By W. K. BROOKS. *Zoologischer Anzeiger*.

The Early Stages of Renilla. By E. B. WILSON. *Amer. Journal of Science*.

Other abstracts are now in press, and others are ready for publication.

A paper, with four plates, on the "Early Stages of the Squid," is also in press, and will soon be issued in the Memorial Volume of Memoirs of the Boston Society of Natural History.

Yours, respectfully,

W. K. BROOKS,

Director of the Chesapeake Zoölogical Laboratory
and Associate in Biology.

SUMMER SEASIDE INSTRUCTION AT FORT WOOL.

In addition to the work of the Chesapeake Zoölogical Laboratory, a class for beginners was conducted at Fort Wool, Va., by Dr. S. F. Clarke, Assistant in the Biological department, during six weeks from July 15, 1880. From his report to the Trustees it appears, that permission having been obtained from the Government, through the courtesy of Major

General Q. A. Gillmore, U. S. A., to use the buildings at Fort Wool during the summer, it was announced by circular that the school would open with accommodations for ten. A good outfit, including Microscopes, Aquaria, Dredges, Nets, Library, etc., having been furnished by the University, the session began July 15th, for a term of six weeks.

The aim and object of the enterprise was to furnish for those who are so interested, an opportunity to become acquainted with the elements of Zoölogy, by a study of the marine animals found in the Chesapeake.

Instruction was given by means of lectures and laboratory direction, and also by daily collecting and observing the various animals in their native haunts. The lectures, twenty-seven in number, extended through the session.

So varied is the animal life about Fort Wool, that the director was able to have on the table, at every lecture, living specimens of the forms under discussion. The party consisted of:

S. F. Clarke, <i>Director</i> .	H. A. Stokes, B. S.
W. H. Howell, <i>Assistant</i> .	H. L. Price.
E. M. Hartwell, A. M.	L. T. Stevens.
Henningham Gordon, A. B.	Wheelock Rider.

Six are from the Johns Hopkins University; Mr. Gordon is an Instructor in the Baltimore City College, and Mr. Rider is of the Rochester University, New York.

G.

List of Donors to the Library, September 1, 1879, to September 1, 1880.

- AMERICAN INSTITUTE OF MINING ENGINEERS. Transactions. Vol. 7. Phila. and Easton: 1879. O.
- AMERICAN COMMITTEE OF BIBLE REVISION. Anglo-American Bible Revision. New York: 1880. D.
- AMMEN, D., Rear Admiral, U. S. N. (Author). The American Oceanic Ship-canal Question. Phila.: 1880. O.
- ARCHÆOLOGICAL INSTITUTE OF AMERICA. First Annual Report. Cambridge: 1880. O.
- BARKER, FORDYCE, M. D. Proceedings of New York Academy of Medicine. New York: 1880. O.
- BARRON, J. H., Supt. Public Property. Geology of Wisconsin. 3 vols. and atlas. Madison, Wis.: 1880. O.
- BEER, R. K., M. D. Henle's Anatom. Hand-atlas. Part I. Braunschweig: 1871. O.
- BOSS, L. Declinations of Fixed Stars. Washington: 1877. Q.
- BOWDITCH, J. INGERSOLL. The Mécanique Céleste of La Place, translated with comm. by Nathaniel Bowditch. 4 vols. Boston: 1829-39. Q.
- BROWNE, WM. HAND, M. D. Plutarchi Opera. 2 vols. Frankfurt: 1599. F.
- CHADWICK, J. R., M. D., Secretary. Transactions of American Gynecological Society. Boston: 1877-79. O.
- COOK, G. H., State Geologist of N. J. Annual Report for 1879. Trenton: 1879. O.
- COUNCIL OF EDUCATION, NEW SOUTH WALES. Report for 1878. Sydney: 1879. O.
- DARBY, J. C., M. D. (Author). Science and the Healing Art. Louisville: 1880. O.
- DIRECTORS ST. LOUIS PUBLIC SCHOOLS. Twenty-fifth Annual Report. St. Louis: 1880. O.
- GAGE, S. H. (Author). The Ampulla of Vater and Pancreatic Ducts in the Cat. New York. O.

- GASPARIN, LA COMTESSE DE. Le Cte. Agénor de Gasparin. Par T. Borel. Paris: 1879. D.
- GARRETT, J. HARRISON. Bibliography of B. & O. Railroad, 1827 to 1879. Compiled by J. W. M. Lee. Baltimore: 1879.
- GRANT, S. H. Report New York Produce Exchange. New York: 1880.
- GREENWAY, E. M. JR. Words, their History and Derivation. By F. Ebener and E. M. Greenway, Jr. Baltimore: 1871. Q.
- HALE, REV. C. R., D. D. Fac-similes of Church Documents. 1874-79. O.
- HALLLOWELL, H. C. Euler, L. Elements of Algebra. London: 1797. O.
- Biot, J. B. Géométrie Analytique. Paris: 1828. O.
- Lacroix, S. F. Traité du calcul diff. et int. Paris: 1828. O.
- Feuchtwanger, L. Treatise on Gems. New York: 1858. O.
- Emerson, W. Projection of the Sphere. London: 1769. O.
- Stewart, M. Tracts, physical and mathematical. Edinburgh: 1761. O.
- Vince, S. Principles of Fluxions. Phila.: 1812. O.
- Simson, R. Conic Sections. Phila.: 1809. O.
- Leslie, J. Geometrical Analysis. Edinburgh: 1821. O.
- HAMILTON, GOV. W. T. History of Maryland. By J. T. Scharf. 3 vols. Baltimore: 1879. O.
- Revised Code of Maryland. Vol. I. Baltimore: 1879. O.
- KATO, H. Calendar of University of Tokio, Japan. Tokio: 1880. D.
- KENLY, GEN. J. R. (Author). Memoirs of a Maryland Volunteer. Phila.: 1878. O.
- LANMAN, Prof. C. R. (Author). On Noun Inflection in the Veda. New Haven: 1880. O.
- MARYLAND HISTORICAL SOCIETY. Character of the Province of Maryland. By G. Alsop. Baltimore: 1880. O.
- Papers Relating to Early History of Maryland. By S. F. Streeter. Baltimore: 1876. O.
- MURPHY, J. & Co. Laws of Maryland; Session 1880. Baltimore: 1880. O.
- Code of Procedure of Maryland. By Messrs. Mayer, Fischer and Cross. Baltimore: 1880. O.
- F. W. Faber's Hymns. Baltimore: 1880. D.
- NEWCOMB, Prof. S. (Author). Astronomical Papers. 3 vols. Washington: 1879. Q.
- OTT, I., M. D. (Author). Action of Medicines. Phila.: 1878. O.
- SCUDDER, S. H. (Author). Insects from British Columbia. Boston: 1878. Q.
- Paleozoic Cockroaches. Boston: 1879. Q.
- SMITHSONIAN INSTITUTION. Miscellaneous Collections. Vols. 16 and 17. Scientific Writings of James Smithson. Journals of Board of Regents. Washington: 1879. O.
- Contributions to Knowledge. Vol. 22. Washington: 1880.
- STEVENSON, PROF. J. J. (Author). Report on Geology of Colorado. Washington: 1875. Q.
- Reports of Geological Survey of Penna. 3 vols. Harrisburg: 1875-79. O.
- STOCKWELL, T. B., Commr. Public Schools, R. I. Tenth Annual Report Board of Education. Providence: 1880. O.
- SYLVESTER, Prof. J. J. History of the Great Trigonometrical Survey of India. By J. T. Walker. 4 vols. Dehra Dun: 1879. Q.
- TAYLOR, W. B. (Author). Henry's Contribution to the Electro-magnetic Telegraph. Washington: 1879. O.
- UNITED STATES. DEPARTMENT OF THE INTERIOR. Journals of Senate and House. 4 vols. O.
- Pacific Coast Pilot. Alaska. App. I.
- Entomological Comm'n Bulletins. Nos. 3 and 5.
- Tenth and Eleventh Annual Reports of Geolog. and Geograph. Survey of Territories. Washington: 1879-80. O.
- Report on Lands in the Arid Region. By J. W. Powell. Washington: 1878.
- Report on Geology of the Henry Mountains. By G. K. Gilbert. Washington: 1877.
- UNITED STATES. ENGINEER DEPARTMENT, U. S. A. Report of Survey W. of 100th Meridian. Vol. 6. Botany. Washington: 1878. Q.
- UNITED STATES. NAVY DEPARTMENT. Report on Experiments in Boiler-bracing. Washington: 1879. O.
- Report of Observations of Transit of Mercury. Washington: 1879. Q.
- Washington Observations for 1869, 70, 71, and 72. 6 vols. Q.
- UNITED STATES. WAR DEPARTMENT. Report upon the Physics and Hydraulics of the Mississippi River. By A. A. Humphreys and H. L. Abbott. Washington: 1878. Q.
- On the use of the Barometer in Surveys, &c. By R. S. Williamson. N. York: 1868. Q.
- UNIVERSITY OF CINCINNATI. Micrometrical Measurements of Double Stars. Cincinnati: 1879. Q.
- WISCONSIN HISTORICAL SOCIETY. Report and Collections. Madison: 1879. O.
- WYETH, J. A., M. D. (Author). Essays in Surgical Anatomy. New York: 1879. O.
- YALE COLLEGE LIBRARY. Catalogue of Greek and Roman Coins. By J. Edwards. New Haven: 1880. O.

H.

Contents of Journals issued under the auspices of the Johns Hopkins University.

I.

AMERICAN JOURNAL OF MATHEMATICS.

Editor in Chief: J. J. SYLVESTER. *Associate Editor in Charge:* WILLIAM E. STORY. Vol. I, 1878; Vol. II, 1879; Vol. III, (in progress), 1880.

CONTENTS.

- BURR, WILLIAM H.—On the Theory of Flexure, ii. 18–45; Note on the same, ii. 191.
- CAYLEY, A.—Calculation of the Minimum N. G. F. of the Binary Seventhic, ii. 71–84;
A Link-Work for x^2 . (Extract from a Letter to Mr Sylvester), i. 386.
Desiderata and Suggestions.—No. 1. The Theory of Groups, i. 50–52;
No. 2. The Theory of Groups: Graphical Representation, i. 174–176;
No. 3. The Newton-Fourier Imaginary Problem ii. 97; No. 4. Mechanical Construction of Conformable Figures, ii. 186;
- CHACE, A. B.—A Certain Class of Cubic Surfaces Treated by Quaternions, ii. 315–323.
- CLIFFORD, W. K.—Remarks on the Chemico-Algebraical Theory. (Extract from a Letter to Mr Sylvester), i. 126–128;
Applications of Grassman's Extensive Algebra, i. 350–358.
- CRAIG, T.—The Motion of a Point upon the Surface of an Ellipsoid, i. 359–364;
The Motion of a Solid in a Fluid, ii. 162–177;
Note on the Projection of the General Locus of Space of Four Dimensions into Space of Three Dimensions, ii. 252–259;
On the Motion of an Ellipsoid in a Fluid, ii. 260–279;
Orthomorphic Projection of an Ellipsoid upon a Sphere, iii. 114–127.
- CROFTON, M. W.—Generalization of Leibnitz's Theorem in Statics. (Extract from a Letter to Professor Sylvester), ii. 191.
- DIXON, T. S. E.—A New Solution of Bi-quadratic Equations, i. 283.
- EDDY, H. T.—The Theorem of Three Moments, i. 27–31;
The Elastic Arch, i. 241–244;
The Two General Methods in Graphical Statics, i. 322–335;
On the Lateral Deviation of Spherical Projectiles, ii. 85–88.
- ENGLER, E. A. and M. L. HOLMAN.—The Tangent to the Parabola, i. 379–383.
- FALL DE BRUNO, F.—Notes on Modern Algebra, iii. 154–163.
- FRANKLAND, A.—Remarks on Chemico-graphs. (Extract from a Letter to Mr. Sylvester), i. 345–349.
- FRANKLIN, F.—Bipunctual Co-ordinates, i. 148–173;
On a Problem of Isomerism, i. 365–368;
Note on Indeterminate Exponential Forms, i. 363;
Note on Partitions, ii. 187;

- On the Calculation of the Generating Functions and Tables of Ground-forms of Binary Quantics, iii. 128-153;
 Note on the Intersections of Two Curves, iii. 192.
 Also see J. J. Sylvester.
- GASPARIS, A. DE.—Extract from a Letter to Mr. Sylvester, ii. 99.
- GIBBS, J. W.—On the Fundamental Formulæ of Dynamics, ii. 49-64.
- GLASHAN, J. C.—An Extension of Taylor's Theorem, i. 287;
 Change of the Independent Variable, iii. 190-191.
- HALL, E. H.—On a New Action of the Magnet on Electric Currents, ii. 287-292.
- HALSTED, G. B.—Bibliography of Hyper-Space and Non-Euclidean Geometry, i. 261-276, 384, ii. 65-70;
 Note on the First English Euclid, ii. 46-48.
- HAMMOND, J.—On the Mechanical Description of the Cartesian, i. 283;
 On General Differentiation, iii. 164-178.
- HILL, G. W.—Researches in the Lunar Theory, i. 5-26, 129-147, 246-260.
- HOLMAN, M. L.—See E. A. Engler.
- JOHNSON, W. W.—Note on the "15" Puzzle, ii. 397-399.
- KEMPE, A. B.—On the Geographical Problem of the Four Colors, ii. 198-200.
- KENDALL, O. H.—On a Short Process for Solving the Irreducible Case of Cardan's Method, i. 285-287.
- LADD, C.—The Pascal Hexagram, ii. 1-12;
 On De Morgan's Extension of the Algebraic Processes, iii. 210-225.
- LIPSCHITZ, B.—Demonstration of a Fundamental Theorem obtained by Mr. Sylvester, i. 336-340.
- LOUDON, J.—Euler's Equations of Motion, i. 387;
 Condition of a Straight Line Touching a Surface, i. 388;
 Notes on Relative Motion, iii. 174-178.
- LUCAS, E.—Théorie des Fonctions Numériques Simplement Périodiques, i. 184-240, 289-321;
 Sur l'Analyse indéterminée du troisième degré—Démonstration de plusieurs théorèmes de M. Sylvester, ii. 178-185.
- MALLET, J. W.—Some Remarks on a Passage in Professor Sylvester's Paper as to the Atomic Theory, i. 277-281.
- MCCCLINTOCK, E.—An Essay on the Calculus of Enlargement, ii. 101-161;
 A New General Method of Interpolation, ii. 307-314;
 On a Theorem for Expanding Functions of Functions, ii. 348-353;
 Note on a Theorem for Expanding Functions of Functions, iii. 173.
- MITCHELL, O. H.—On Binomial Congruences: Comprising an Extension of Fermat's and Wilson's Theorems, and a Theorem of which Both are Special Cases, iii. (in press).
- MUIR, J.—Letter to Mr. Sylvester on the word Continuant, i. 344.
- NEWCOMB, S.—Note on a Class of Transformations which Surfaces may undergo in Space of more than Three Dimensions, i. 1-4;
 A Method of Developing the Perturbative Function of Planetary Motion, iii. 193-209.
- PEIRCE, C. S.—Review of Ferrero's *Esposizione del Metodo dei Minimi Quadrati*, i. 59-63;
 On the Ghosts in Rutherford's Diffraction-Spectra, ii. 330-347;
 A Quincuncial Projection of the Sphere, ii. 394-396;
 On the Algebra of Logic, iii. 15-57.

- PETERSEN, J.—A New Proof of the Theorem of Reciprocity, ii. 285.
- PHILLIPS, A. W.—A Link-Work for the Lemniscate. (Extract from a Letter to Mr. Sylvester), i. 386.
- ROWLAND, H. A.—Note on the Theory of Electric Absorption, i. 53-58;
Preliminary Notes on Mr. Hall's Recent Discovery, ii. 354-356;
On the General Equations of Electro-magnetic Action, with Application to a New Theory of Magnetic Attraction, and to the Theory of the Magnetic Rotation of the Plane of Polarization of Light, iii. 89-96;
On the Motion of a Perfect Incompressible Fluid when no Solid Bodies are Present, iii. 226. (in press).
- STONE, O.—On the Dynamics of a "Curved Ball," ii. 211-213.
- STORY, W. E.—On the Elastic Potential of Crystals, i. 177-183;
Note on Mr. Kempe's Paper on the Geographical Problem of the Four Colors, ii. 201-204;
Note on the "15" Puzzle, ii. 399-404.
- STRINGHAM, W. I.—Some General Formulae for Integrals of Irrational Functions, ii. 188-190;
The Quaternion Formulae for Quantification of Curves, Surfaces and Solids, and for Barycentres, ii. 205-210;
Regular Figures in n-dimensional Space, iii. 1-14.
- SYLVESTER, J. J.—On an Application of the New Atomic Theory to the Graphical Representation of the Invariants and Covariants of Binary Quantics, i. 64-83;
On Differentiants Expressed in Terms of the Differences of the Roots of their Parent Quantics, (*Appendix 1*), i. 83-90;
Note on M. Hermite's Law of Reciprocity, (*Appendix 2*), i. 90-118;
Completion of the Theory of Principal Forms, (*Appendix 2, Note A*), i. 106;
Additional Illustrations of the Law of Reciprocity, (*Appendix 2, Note B*), i. 107-112;
On the Principal Forms of the General Sextinvariant to a Quartic and Quartinvariant to a Sextic, (*Appendix 2, Note C*), i. 112-114;
On the Probable Relation of the Skew Invariants of Binary Quintics and Sextics to one another and to the Skew Invariant of the same Weight of the Binary Nonic, (*Appendix 2, Note D*), i. 114-118;
On Clebsch's "Einfachstes System associirter Formen" and its Generalization, (*Appendix 3*), i. 118-124;
Note on the Ladenburg Carbondigraph, i. 125;
Note on the Theorem Contained in Professor Lipschitz's Paper, (see i. 336-340), i. 341-343;
Synoptical Table of the Irreducible Invariants and Covariants to a Binary Quintic, with a Scholium on a Theorem in Conditional Hyperdeterminants, i. 370-378;
Note on Determinants and Duadic Disyntheses, ii. 89-96, 214-222;
On the Complete System of the "Grundformen" of the Binary Quantic of the Ninth Order, ii. 98;
On Certain Ternary Cubic-Form Equations :—
On the Resolution of Numbers into the Sums or Differences of Two Cubes, (*Chapter 1, Section 1, Proem*), ii. 280-285;
On the Divisors of Cyclotomic Functions, (*Excursus A*), ii. 357-381;
On Triangles and Polygons in- and ex-scribed to a Cubic Curve, and on 2 and 3 as Cubic Residues, (*Notes to Proem, Section 1*), ii. 381-389;

- On Numbers Irresoluble into the Sum or Difference of Two Rational Cubes: Irresoluble Numbers not containing Factors of the Form $6n + 1$, (*Notes to Proem, Section 2, Title 1*), ii. 889-893;
 On the Chain Rule of Cubic Rational Derivation. On the Natural or Discontinuously Numbered Scale of Rational Derivatives to a Point on a Cubic Curve, (*Excursus B, Title 1*), iii. 58-68;
 On the Completed or Continuously Numbered Scale of Rational Derivatives to an Arbitrary Point on a Cubic, of which one point of Inflection is given, (*Excursus B, Title 2*), iii. 68-72;
 On Compound Derivation, (*Excursus B, Title 3*), iii. 72-74;
 On Pertactile or Periodic Points on a Cubic Curve, (*Excursus B, Title 4*), iii. 74-81;
 An Exact Proof of the Scalar Law of Squares, (*Excursus B, Title 5*), iii. 81-86, 184-189;
 Addendum on the Degorder of the Derivatives to a Point on a Cubic in the Natural Scale, iii. 86-88;
 On the Trisection and Quartisection of the Roots of Unity to a Prime-Number Index, (*Excursus C*), iii. 179-183.
 Remarks on Tables of the Generating Functions and Groundforms for Simultaneous Binary Quantics of the First Four Orders, &c., ii. 324-329.
 SYLVESTER, J. J. (assisted by F. FRANKLIN)—Tables of the Generating Functions and Groundforms for the Binary Quantics of the First Ten Orders, ii. 223-251;
 Tables of the Generating Functions and Groundforms for Simultaneous Binary Quantics of the First Four Orders taken two and two together, ii. 298-306;
 WEICHHOLD, G.—Solution of the Irreducible Case, i. 32-49.

II.

AMERICAN CHEMICAL JOURNAL.

Edited by PROFESSOR REMSEN. Vol. I, 1879; Vol. II, 1880.

CONTENTS.

- ADOR, E.—See J. M. Crafts.
 ARMSBY, H. P.—On the Determination of Albuminoids in Hay and Coarse Fodders, ii. 81-85;
 Review of Recent Progress in Agricultural Science, ii. 339-342, (also in press).
 BEAMER, M.—See F. W. Clarke.
 BURNET, W.—See Ira Remsen.
 CHITTENDEN, R. H.—Report on Progress in Physiological Chemistry, ii. 204-212, 268-273;
 ——— and H. H. DONALDSON.—On the Detection and Determination of Arsenic in Organic Matter, ii. 235-244.
 Also see S. W. Johnson.
 CLARKE, F. W.—Specific Gravity Determinations, ii. 174;
 Report on the Subsection of Chemistry at Boston, ii. 274-279.
 ——— and H. STALLO.—The Constitution of the Tartrates of Antimony, ii. 319-329.

- CLARKE, F. W. and M. E. OWENS.—On a New Variety of Tetrahedrite, ii. 178;
 Some New Salts of Uranium, ii. 331.
 — and M. BEAMER.—On some New Salts of Aniline, i. 151-158;
 Note on Lithium Picrate, i. 153;
 On the Relative Stability of Certain Organic Salts, ii. 329.
 — and W. L. DUDLEY.—Graphite from Ducktown, Tennessee, ii. 331.
 COALE, R. D.—Action of Oxidizing Agents on the Oxybenzoic Acids
 and on Phthalic Acid, ii. (in press).
 CORNWALL, H. B.—Gallium in American Blendes, ii. 44;
 Nitrication in Standard Ammonium Chloride Solutions, ii. 45.
 CRAFTS, J. M.—On the Relative Densities of Permanent Gases at High
 Temperatures, ii. 98-107.
 — and E. ADOR.—The Action of Phthalic Anhydride on Naphtha-
 lene in the presence of Chloride of Aluminium, i. 267-270.
 — and F. MEIER.—The Vapor Density of Iodine, ii. 108-130.
 DEWEY, F. P.—On Clarke's Method for the Separation of Tin from
 Arsenic and Antimony, i. 244-251.
 DONALDSON, H. H.—See R. H. Chittenden.
 DROWN, T. M.—Note on the Determination of Silicon in Pig Iron and
 Steel, i. 147-149.
 DUDLEY, W. L.—Spigelia, i. 154;
 On a Modification of Böttger's Test for Sugar, ii. 47;
 A New Test for Gallic Acid, ii. 48;
 Also see F. W. Clarke.
 FAHLBERG, C.—On the Liquid Toluene-sulphochloride, i. 170-175;
 On A-Toluenedisulphonic Acid and its Derivatives, ii. 181-198;
 Also see Ira Remsen.
 FIELD, A. W.—See C. L. Jackson.
 GENTH, F. A.—Examination of the North Carolina Uranium Minerals,
 i. 87-93.
 GENTH, F. A., JR.—On Several Spanish Minerals, i. 323-326.
 GIBBS, WOLCOTT.—On the Complex Inorganic Acids, i. 1-4, 217-239;
 ii. 217-234, 281-294.
 GOOCH, F. A.—On a New Method for the Separation and Subsequent
 Treatment of Precipitates in Chemical Analysis, i. 317-323;
 On the Estimation of Phosphoric Acid as Magnesic Pyrophosphate,
 i. 391-418;
 A New Form of Absorption Apparatus for Use in Estimating Ammo-
 nia, i. 450, 451;
 A Tubulated Crucible for Use in Estimating Volatile Products of Igni-
 tion, ii. 247-250.
 GREENE, W. H.—On a New Synthesis of Saligenin, ii. 19;
 On the Action of Hydrochloric Acid and of Chlorine on Acetobenzoic
 Anhydride, ii. 96-98.
 — and J. A. LE BEL.—On the Decomposition of Alcohols, etc., by
 Zinc Chloride at High Temperatures, ii. 20-26.
 GUNDELACH, C.—See A. Michael.
 HALL, L. B.—See Ira Remsen.
 HALLOCK, E. J.—Note on Para-Nitro and Para-Amido-Phenetol, i. 271;
 Chloro-Nitro-Phenetol, ii. 258.

- HART, E.**—Stopcock of Easy Construction, i. 209;
Nitrosulphobenzoic Acids and some Derivatives, i. 340-356.
- HASTINGS, C. S.**—On Lockyer's "Hypothesis that the so-called Elements are Compound Bodies," i. 15-26.
- HILL, H. B. and C. F. MABERY.**—On the Ethers of Uric Acid, ii. 305-315.
- ILES, M. W.**—See Ira Remsen.
- JACKSON, C. L.**—Researches on the Substituted Benzyl Compounds:
Introduction, i. 98-105;
— and A. W. FIELD.—The Action of Bromine on Toluol, and Some of its Derivatives, ii. 1-11;
— and A. W. FIELD.—Para-chlor benzyl Compounds, ii. 85-95;
— and J. F. WHITE.—Para-chlor-benzyl Compounds, ii. 158-171;
— and C. F. MABERY.—On Paraiodbenzyl Compounds, ii. 250-257;
— and J. F. WHITE.—Orthobrombenzyl Compounds, ii. 815-819;
— and J. F. WHITE.—The Synthesis of Anthracene and Phenanthrene from Orthobrombenzylbromide, ii. (in press).
- JENKINS, E. H.**—See S. W. Johnson.
- JEWETT, J.**—Influence of Acetic Acid on the Separation of Iron as a Basic Acetate from Manganese, Zinc, Cobalt and Nickel, i. 251-255.
- JOHNSON, S. W. and E. H. JENKINS.**—Determination of Nitrogen in the Analysis of Agricultural Products, i. 77-83;
On a Method for the Determination of Phosphoric Acid, i. 84-86;
On the Determination of Nitrogen, ii. 27-34.
— and R. H. CHITTENDEN.—On the Distribution of Arsenic in the Human Body in a Case of Arsenical Poisoning, ii. 332-337.
- KÖNIG, G. A.**—On Jarosite from a New Locality, ii. (in press).
- KUHARA, M.**—A Method for Estimating Bismuth Volumetrically, i. 326-329;
A New Method of Formation of Phthalimide, ii. (in press);
Also see Ira Remsen.
- LEBEL, J. A.**—See W. H. Greene.
- LOCKYER, J. N.**—Discussion of the Working Hypothesis that the so-called Elements are Compound Bodies, i. 10-15.
- MABERY, C. F.**—See H. B. Hill and C. L. Jackson.
- MALLET, J. W.**—On Nitrogen Iodide, i. 4-9, 208;
On an Unusual Case of Electrolysis, i. 438-440;
Reports on Industrial Chemistry, i. 58-66, 184-203, 273-284, 356-361, 440-449; ii. 62-67, 143-150, 259-268, (also in press);
Notes on "Uranine," i. 69;
Review of Dudley's "Chemical Composition of Steel Rails," i. 205-207;
Review of Shepard's "Foreign Phosphates," i. 207;
Review of Post's "Grundriss der chemischen Technologie," ii. 212-214;
Review of Girardin's "Leçons de Chimie Élémentaire appliquée aux Arts Industriels," ii. 214;
Review of Lunge's Treatise on the Manufacture of Sulphuric Acid and Alkali, ii. 342-346;
On a Simple Form of Apparatus for Determining the Specific Heat of Solids and Liquids with Small Quantities of Material, ii. (in press).
- MARTIN, H. N.**—Review of Vaughan's "Lecture Notes on Chemical Physiology and Pathology," i. 57.
Review of Kingzett's "Animal Chemistry," i. 203-205.
- MCCARTER, H. G.**—See S. P. Sadler.

- MEIER, F.—See J. M. Crafts.
- MEYER, V.—Concerning Iodine, ii. 175.
- MICHAEL, A.—On the Synthesis of Helicin and Phenolglucoside, i. 805-812;
On a New Formation of Stilbene and Some of its Derivatives, i. 812-816;
On Monoethylphthalate, i. 418-416;
On a New Formation of Ethyl-mustard Oil, i. 416-418;
On the Preparation of Methyl-aldehyde, i. 418-420;
On the "Migration of Atoms in the Molecule," and Reimer's Chloroform Aldehyde Reaction, i. 420-426.
- and L. M. NORTON.—On the Action of Iodine Monochloride upon Aromatic Amines, i. 265-267;
On α - and β -Monobromocrotonic Acids, ii. 11-19.
- and O. GUNDELACH.—Preliminary Note on the Synthesis of Methylconine and Constitution of Conine, ii. 171.
- MIXTER, W. G.—On Some Compounds of Aromatic Amines with Silver Nitrate and Sulphate, i. 239-243;
On the Density of the Vapors of Some Ammonium and Ammonia Compounds, ii. 153-158;
Estimation of Sulphur in Illuminating Gas by Burning in Oxygen, ii. 244-247.
On Sauer's Method of Estimating Sulphur and Some Modifications, ii. (in press).
- MORSE, H. N.—Review of Classen's "Elementary Quantitative Analysis," i. 207;
Report on Progress in Analytical Chemistry, i. 284-291, 361-367; ii. 67-76, 199-204;
On the Determination of Barium as Chromate, ii. 176-181;
Also see Ira Remsen.
- NORTON, L. M.—See A. Michael.
- OWENS, M. E.—See F. W. Clarke.
- PARSONS, H. B.—A Method for the Proximate Analysis of Plants, i. 377-391.
- PEIRCE, G. K.—See E. F. Smith.
- PENFIELD, S. L.—On a new Volumetric Method of Determining Fluorine, i. 27-29.
- PRESCOTT, A. B.—Estimation of Alkaloids by Potassium Mercuric Iodide, ii. 294-304.
- REMSEN, IRA.—On the Oxidation of Substitution Products of Aromatic Hydro-carbons:
I. Introduction, i. 32-37;
II. — and M. W. LILES.—On the Oxidation of Xylenesulphamides, i. 37-51, 114-138;
III. — and H. N. MORSE.—On the Oxidation of Bromparaethyltoluene, i. 138-146;
IV. — and C. FAHLBERG.—On the Oxidation of Orthotoluene-sulphamide, i. 426-438;
V. — and L. B. HALL.—Experiments in the Para-Series, ii. 50-62;
VI. — and L. B. HALL.—Experiments with Mesitylene, ii. 130-143;
VII. — and W. BURNEY.—Sulphoterephthalic Acid, ii. (in press);
VIII. — and M. KUHARA.—Formation of Sulphoterephthalic by Direct Oxidation, ii. (in press);

REMSEN, IRA—Continued.

- Review of Sylvester's Article "On an Application of the New Atomic Theory to the Graphical Representation of the Invariants and Co-variants of Binary Quantics," i. 52-56;
 Review of Beilstein's *Handbuch der organischen Chemie*, ii. 346, 347;
 Report on Some Recent Investigations in Physical Chemistry, ii. 347-354;
 Review of Wurtz's "The Atomic Theory," ii. 355-357.
- SADTLER, S. P., and H. G. McCARTER**—Preliminary Notice of an Investigation on "Petrocene," a Product of the Destructive Distillation of Petroleum, i. 80-82.
- SEDGWICK, W. T.**—Potassium Permanganate and the Strychnine Test, i. 369;
 The Relations of Eupatorium and Strychnine, i. 370.
- SMITH, E. F.**—On a New Base, i. 150;
 Analysis of a Calculus found in a Deer, i. 210;
 New Results in Electrolysis, i. 329-340;
 The Electrolytic Method as Applied to Cadmium, ii. 41-44;
 Synthesis of Salicylic Acid, ii. 338.
- and G. K. PEIRCE.—On the Products obtained by the Nitration of Metachlorsalicylic Acid, i. 176-181.
- SMITH, J. C.**—A Device for the Rapid Filtration of the Carbon in Cast Iron and Steel Analyses, i. 368.
- SPRINGER, A.**—On Glycocholic Ether, i. 181-188.
- STALLO, H.**—See F. W. Clarke.
- STILLMAN, J. M.**—Gum Lac from Arizona, ii. 34-38;
 Ethereal Oil of California Bay Tree, ii. 38-40.
- THORPE, T. E.**—On Heptane from *Pinus Sabiniana*, i. 155-169.
- WHITE, J. F.**—See C. L. Jackson.
- WILEY, H. W.**—Note on the Absorption Spectrum of Uranine, i. 211;
 Note on the Delicacy of the Test for Cobalt with Cyanide of Potassium and Yellow Sulphide of Ammonium, i. 211;
 Detection of Hydrochloric Acid by Sulphuric Acid and Acid Potassium Chromate, ii. 48, 49.
- YOUNG, A. V. E.**—An Apparatus for Gas Analysis from Simple Laboratory Material, i. 105-114.

III.

THE AMERICAN JOURNAL OF PHILOLOGY.

Edited by PROFESSOR GILDERSLEEVE. Vol. I, 1880.

CONTENTS.

- ALLEN, F. D.—Etymological and Grammatical Notes, i. 127-145.
- ALLINSON, F. G.—The Parodos of Aristophanes' *Vespae*, i. 402-409;
Note on *πιap* as an Adjective, i. 458-460.
- BLOOMFIELD, M.—"The 'Ablaut' of Greek Roots which show Variation between E and O," i. 281-326.
- BRANDT, H. C. G.—Recent Investigations of Grimm's Law, i. 146-160;
Review of Hewett's "The Frisian Language and Literature: A Historical Study," i. 74;
Report on Alemannia, (in press);
Report on Paul u. Braune's *Beiträge*, (in press).
Review of Braune's *Gotische Grammatik*, i. 474.
- BROWN, F.—Review of Murray's "Origin and Growth of the Psalms," i. 357-360.
- CAMPBELL, LEWIS.—The Agamemnon of Aeschylus, i. 427-489.
- CARTER, FRANKLIN.—Two German Scholars on one of Goethe's *Masquerades*, i. 17-31.
- COOK, A. S.—The Word *Weasand*, i. 61-64;
Review of Skeat's *Etymological Dictionary of the English Language*, i. 203-206;
Report on *Englische Studien*, Bd. I, 1877, i. 225-229;
- DAVIDSON, THOMAS.—Note on the Dionysion at Marathon, i. 58, 59;
Review of Vincent and Dickson's "A Handbook to Modern Greek," i. 70-72;
Report on *Athenaion*, i. 103-105;
- D'OUGE, M. L.—Report on Fleckeisen's *Neue Jahrbücher für Philologie und Paedagogik*, 1879, i. 373-378.
- DYER, LOUIS.—Report on *Archaeologische Zeitung*, i. 481-485.
- ELLIOTT, A. M.—The Number and General Character of American Publications for 1879, in *Romance Philology and Literature*, i. 208-210;
Report on *Zeitschrift für Romanische Philologie*, Bd. 111, Heft 4, i. 232-235.
- ELLIS, ROBINSON —On the Codex Neapolitanus of Propertius, i. 389-401.
- FAY, E. A.—Imperfect and Pluperfect Subjunctive in Roman Folk-speech, i. 410-415.
- GARNER, S.—Report on Romania, Nos. 30, 31, 1879, i. 111-116; (a second report in press);
Note on the so-called "Subjonctif Dubitatif," *je ne sache pas*, in the Principal Clause, i. 197-202.
- GARNETT, J. M.—Report on Anglia, Vol. I, i. 88-96; Vol. II, i. 367-372; Vol. III, (in press).
- GILDERSLEEVE, B. L.—Encroachments of *μῦ* on *οῦ* in later Greek, i. 45-57;
Review of Wheeler's "De Alcestidis et Hippolyti Euripidearum Interpolationibus," i. 72, 73;
Review of Tyler's *Greek Lyric Poets*, i. 73, 74.

GILDERSLEEVE, B. L.—*Continued.*

- Review of G. Meyer's *Griechische Grammatik*, i. 463, 464;
- Review of Butcher and Lang's Translation of *Odyssey*, i. 466-468;
- Review of Merriam's *Phaeacians*, i. 468, 469;
- Review of Dunbar's *Concordance to Odyssey*, i. 473.

GOODWIN, W. W.—*Δίκαι ἀπὸ συμβόλων* and *Δίκαι συμβόλαια*, i. 4-16.

HART, J. M.—*Keltic and Germanic*, i. 440-452.

HUMPHREYS, M. W.—*The Fourth Play in the Tetralogy*, i. 187-196;

Review of Clough's *Hexameter and Latin Rhythms*, i. 69, 70;

Report on *Revue de Philologie*, Vols. I, II, III, i. 76-87; Vol. IV, 1, i. 229-232;

Report on *Rheinisches Museum*, XXXV, 1, i. 235-237;

Report on *Revue de Philologie*, IV, 2, pp. 111-114, i. 372, 373;

Varia, i. 453-457.

KNAPP, W. T.—Review of the "Catalogue of the Spanish Library . . . bequeathed by George Ticknor to the Boston Public Library," i. 344, 345.

LANMAN, C. R.—Review of Recent Publications in the Field of Indian Antiquities, i. 345-351;

Review of Whitney's *Sanskrit Grammar*, i. 68, 69.

LODEMAN, A.—Note on *je ne sache pas*, i. 461, 462.

MERRIAM, A. C.—Note on *Iliad B*, (318-319), i. 59, 60.

MORRIS, C. D.—*Xenophon's Oeconomicus*, i. 189-186;

Report on *Mnemosyne*, Vol. VII, Part II, i. 107-111; Vol. VII, Part III, i. 361-367; Vol. VIII, Parts I, II, i. 476-481.

NETTLESHIP, H.—*Verrius Flaccus*, i. 253-270.

O'CONNOR, B. F.—*Principles of Orthography of French Verbs ending in eler and eter*, i. 161-168.

PACKARD, L. R.—*Geddes' Problem of the Homeric Poems*, i. 32-44.

PRICE, T. R.—*Philologus*, Vol. XXXVIII, Parts 3 and 4, 1879, i. 237-241.

RADDAZ, C. F.—Report on *Germania*, 1879, i. 219-225.

SAVAGE, A. D.—Report on *Revue Archéologique*, July, 1879, i. 97-100.

SEYMOUR, T. D.—Report on *Fleckeisen's Neue Jahrbücher*, (in press).

SHEPHERD, H. E.—*The History of Coincide and Coincidence*, i. 271-280.

SIHLER, E. G.—Report on *Hermes*, Vol. XIV, 1879, i. 100-103; No. 1, 1880, i. 379-381; No. 2, 1880, i. 485-490;

Report on *Fleckeisen's Neue Jahrbücher für Philologie und Paedagogik*, 1879, i. 105-107.

TOY, C. H.—*Problems of General Semitic Grammar*, i. 416-427.

Review of Mallery's "Sign Language among the North American Indians," i. 206-208;

Review of Heilprin's *Historical Poetry of the Hebrews*, i. 469-473;

Report on the *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, 1879, i. 211-217; (a second report in press);

Report on the *Journal Asiatique*, 1879, i. 217-219.

WARREN, M.—Review of "Richard Bentley's *Emendationen zum Plautus*," i. 351-357;

Review of Roby's *Latin Grammar for Schools*, i. 464-466;

Review of Weinkauff on *Tacitus' Dialogus*, i. 474-475.

WHITNEY, W. D.—*Logical Consistency in Views of Language*, i. 327-343.

IV.

STUDIES FROM THE BIOLOGICAL LABORATORY.

Edited by Prof. MARTIN, including the Scientific Results of the Chesapeake Zoölogical Laboratory, 1878, 1879, edited by DR. W. K. BROOKS. Vol. I, 1879-80.

CONTENTS.

- ATKINSON, I. E.—The Botanical Relations of *Trichophyton Tonsurans*, (pp. 15).
- BOOKER, W. D.—See H. N. Martin.
- BROOKS, W. K.—The Development of the Oyster, (pp. 101; 10 plates.)
The Acquisition and Loss of a Food Yolk in Molluscan Eggs, (pp. 10; 1 plate).
Observations upon the Early Stages in the Development of the Fresh Water Pulmonates, (pp. 32; 4 plates).
Statement Introductory to "Scientific Results of Chesapeake Zoölogical Laboratory," for 1878, (pp. 14).
The Development of Lingula and the Systematic Position of the Branchiopoda, (pp. 78; 6 plates).
Preliminary Observations upon the Development of the Marine Prosobranchiate Gasteropods, (pp. 22; 1 plate).
The Larval Stages of *Squilla Empusa*, (pp. 28; 5 plates).
- CLARKE, S. F.—The Development of *Amblystoma punctatum*, (pp. 21; 4 plates).
- FAXON, WALTER.—Description of *Lucifer typus*, (pp. 7; 1 plate).
- HARTWELL, E. M.—See H. N. MARTIN.
- MARTIN, H. N.—The Normal Respiratory Movements of the Frog and the Influence upon its Respiratory Centre of Stimulation of the Optic Lobes, (pp. 40; 1 plate).
A Self-feeding Chronograph Pen, (pp. 3).
—— and E. M. HARTWELL.—On the Respiratory Function of the Internal Intercostal Muscles, (pp. 4; 1 plate).
—— and W. D. BOOKER.—The Influence of Stimulation of the Mid-brain upon the Respiratory Rhythm of the Mammal, (pp. 7; 1 plate).
- OTT, ISAAC.—Observations on the Physiology of the Spinal Cord, (pp. 24; 2 plates).
- SEWALL, HENRY.—The Development and Regeneration of the Gastric Glandular Epithelium during Fœtal Life and after Birth, (pp. 14; 1 plate).
On the Effect of Two Succeeding Stimuli upon Muscular Contraction, (pp. 27, 1 plate).
- SIHLER, CHRISTIAN.—On the So-called Heat Dyspnoea, (pp. 11.)
- UHLER, P. R.—List of Animals observed at Fort Wool, Va., (pp. 18).
- WEBSTER, N. B.—Partial List of the Land Plants found at Fort Wool, Va., (pp. 2).

CONTENTS.

	Page.
NAMES OF THE TRUSTEES,	2
REPORT OF THE PRESIDENT :	
Introductory,	3
A. General Review :	
The Faculty of Philosophy,	4
The Advancement and Publication of Researches,	5-7
University Students,	7
Collegiate Students,	8
Public Lectures,	9
Bestowal of Degrees,	10
Books and Apparatus,	11
B. Results of the Fourth Year :	
Summary,	12-13
Personal Changes,	14
Attendance,	15
Classes and Laboratories,	16-19
Public Lectures,	19
Societies and Publications,	20
Commemoration Day,	21
Bestowal of Degrees,	22-24
The Library,	24
Scholarships,	25
Internal Administration,	26
Conclusion,	27-28
 APPENDIX :	
A. Academic Staff, 1876-80,	29-30
B. Roll of Fellows,	31-41
C. List of Graduates,	42
D. Enumeration of Classes, 1879-80,	43-50
E. System of Fellowships,	51-53
F. Report of the Chesapeake Zoölogical Laboratory,	54-60
Summer Seaside Instruction at Fort Wool,	60
G. Gifts to the Library,	61-62
H. Contents of Journals Published under the Auspices of the University :	
I. American Journal of Mathematics,	63-66
II. American Chemical Journal,	66-70
III. The American Journal of Philology,	71, 72
IV. Studies from the Biological Laboratory,	73

This Report covers the Academic year ending September 1, 1880. The Appendix contains some statements of a more recent date.

The following Scientific Periodicals are issued, at stated intervals, under the auspices of the University :

- I. American Journal of Mathematics. (Professor J. J. SYLVESTER, Editor in Chief; Dr. W. E. STORY, Editor in Charge). Quarto. Four numbers make a volume. Vol. I, 1878-79, (388 pp., 4 plates); Vol. II, 1879-80, (408 pp., 3 plates); Vol. III, 1880-81. Subscription price, per vol., \$5.00, price per number, \$1.50.
 - II. American Chemical Journal. (Professor IRA REMSEN, Editor). Six numbers make a volume. Vol. I, 1879-80, 460 pp.; Vol. II, 1880-81. Subscription price, per vol., \$3.00, price per number, 50 cents.
 - III. Studies from the Biological Laboratory. (Professor H. N. MARTIN and Dr. W. K. BROOKS, Editors). Vol. I, 1879-80, (496 pp., 39 plates). Four numbers make a volume. Price, per vol., \$5.00; price per number, \$1.50.
 - IV. The American Journal of Philology. (Professor B. L. GILDERSLEEVE, Editor). Four numbers make a volume. Vol. I, 1880. Subscription price, \$3.00 per volume.
 - V. The Journal of Physiology. (MICHAEL FOSTER, M. D.; F. R. S., Cambridge, England, Editor in Chief.) This Journal will in future be published in America with the aid of the Johns Hopkins University, and will be issued from the University to subscribers. Six parts form a volume of about 500 pp. Vol. I, 1878-79, (626 pp., 17 plates); Vol. II; 1879-80, (596 pp., 13 plates); Vol. III, 1880-81. Subscription price, \$5.00 per volume.
-

The Official Publications of the University are as follows :

- I. An ANNUAL REPORT presented by the President to the Board of Trustees, reviewing the operations of the University during the past academic year.
- II. The UNIVERSITY CIRCULARS, issued from time to time, and giving current information as to the work here in progress or proposed.
- III. A REGISTER giving a list of the officers, academic staff and students, stating generally the nature and amount of the instruction given and work actually done or in progress during the current year, and exhibiting in detail the scheme and regulations of the University.

DO NOT CIRCULATE

~~6772~~

UNIVERSITY OF MICHIGAN



3 9015 06852 4035

77+10
1878+39
79+300

